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From Government to Governance: A State-of-the-Art Review of Environmental Governance

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Preface

This report was prepared under contract to Alberta Environment by Rob de Loë Consulting Services. Members of the project team included Rob de Loë, Ryan Plummer, Derek Armitage, Seanna Davidson and Liana Moraru.

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This report provides the research, analysis and expert opinions of the authors and as such does not necessarily represent the views of the Government of Alberta.

Executive Summary

Societies can meet the challenge of sustainably using natural resources in many different ways. Some take a top-down approach where senior governments make all the key decisions. Others spread authority and responsibility for decision making widely – sharing it among levels of government (from local to national), individuals, firms, and non-government organizations. The term *governance* is used in the literature to describe the different ways in which societies can organize themselves to accomplish their goals.

Governance has emerged as a critical concern in a host of settings, including international relations, the proper functioning of corporate boards, and the manner in which societies should address environmental problems. Many perspectives on governance exist in the academic literature, reflecting different disciplinary perspectives and the nature of specific concerns. One area in which a distinct perspective on governance exists is the environment. *Environmental governance* can be defined simply as the processes and institutions through which societies make decisions that affect the environment.

This study presents a state-of-the-art literature review of current academic thinking regarding environmental governance, with a focus on considerations that are relevant to water management and water allocation. The overall perspective is broad, but concerns that are especially pertinent to water and environmental governance in Alberta are emphasized. Examples of specific concerns relevant to this study include the following:

- Pressure on water resources in Alberta is intense. Water scarcity and water quality contamination are a concern in several watersheds. Climate change and future economic development are expected to magnify concerns relating to water shortages and contamination. Thus, balancing economic, social and environmental objectives for water is a major challenge.
- The Water for Life strategy has changed the way water planning takes place in the province, with new roles for people and organizations outside of government. More recently, the new Land-Use Framework is establishing a regional approach to planning based on cumulative effects management. Ensuring that these strategies are integrated effectively with each other, and with existing regulatory mechanisms, is an important governance-related concern.

The approach to environmental governance that is unfolding in Alberta is part of a global shift that is taking place around the world. This shift is sometimes characterized as a transition from *government* to *governance*, and reflects the fact that governments no longer are, and in many cases cannot be, the sole source of environmental decision making authority. Instead, through mechanisms that range from markets to co-management arrangements, actors such as corporations, non-government organizations, public-private partnerships and quasi-governmental boards now play key roles in environmental governance.

Environmental governance can occur through a host of different mechanisms. Generic or ideal models common in the literature include regulatory instruments; market regulation; civil society; co-operative management; and contextual control and self-regulation. These ideal models reflect different orientations (e.g., economics versus law) and are grounded in basic assumptions about human behaviour and how societies function. Each has specific strengths and weaknesses. Importantly, real-world environmental governance inevitably involves a mix of mechanisms (e.g., combinations of regulations, market mechanisms and co-management arrangements).

In jurisdictions that have embarked on the shift from government to governance, the challenge is not simply to pick a new model (e.g., "markets" or "co-operative management" instead of traditional regulatory approaches). Simply grafting new kinds of governance institutions onto existing arrangements is not always feasible either. Instead, making the transition from government to governance typically demands a change in thinking about who does what in society, how decisions should be made, what kinds of knowledge will be used, who will be accountable, and how social and ecological systems are interconnected.

There is enormous debate in the literature, and among practitioners, regarding how governance should occur in specific places. Nonetheless, a general consensus is emerging that environmental governance should involve forms of group decision making that accommodate diverse views, that networks and hybrid partnerships among state and non-state actors are needed, that shared learning is critical, and that governance should provide opportunities for adaptability and positive transformation. This view reflects the fact that environmental governance is inherently dynamic and multi-level.

The academic literature offers useful insights on six key concerns that must be considered in pursuing innovative approaches to environmental governance. These relate to accountability and legitimacy; actors and roles; fit, interplay and scale; adaptiveness, flexibility and learning; evaluation; and knowledge. Each concern is explored in detail in this report, and insights from the literature on how these concern can be addressed are offered. Examples from the specific context of water management are used to illustrate the practical relevance of the six concerns, and a brief case study of water governance in the Murray-Darling Basin, Australia, is used to reveal interactions among the concerns.

Developing an "environmental governance roadmap" for Alberta was not an objective in this study. Nonetheless, several key insights that are particularly relevant to Alberta emerge from the state-of-the-art literature review of current academic thinking regarding environmental governance that was conducted. These include the following:

- New shared governance mechanisms are being created (e.g., Water for Life and the Land-Use Framework), while existing regulatory mechanisms remain in place (e.g., the *Water Act*). To avoid conflicts and to ensure successful outcomes, care will be needed to address questions of fit and interplay among these various mechanisms. .
- Management of interactions among the various spatial boundaries important to governance should be a priority (e.g., planning regions under the Land-Use Framework, watersheds under Water for Life). Networks can be used effectively to transcend these boundaries, but an ongoing commitment to creating and sustaining these networks is required.

- The level of participation of actors outside of government must be matched to appropriate amounts of authority. A failure to address this concern can undermine future efforts to share responsibility for governance. Capacity building is essential in this context.
- Evaluation of social and environmental outcomes of governance is an important way to measure success, but simplistic criteria applied universally are not appropriate. A rigid focus on performance indicators and target conditions for resources, at the expense of desired long-term change in behaviour and attitudes, can be especially problematic.
- Adaptive approaches that recognize that change and uncertainty are normal in the complex environment in which water is situated are needed. As governance is transformed, especially through legal and regulatory mechanisms, it will be critical to ensure that the potential for adaptation is preserved.
- The knowledge needed to deal with complex social-ecological systems takes different forms (e.g., scientific and local) and is held by actors outside of governments. It is important to recognize that non-state actors can be knowledge generators as well as knowledge recipients.

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1. Introduction

All societies face the common challenge of sustainably using natural resources. How they meet this challenge depends on a host of factors relating to their histories, cultures, political systems, and other socio-economic circumstances. Some take a top-down approach where senior governments make all the key decisions. Others spread authority and responsibility for decision making widely – sharing it among levels of government (from local to national), individuals, firms, and non-government organizations.

The term *governance* is used in the literature to describe the different ways in which societies can organize themselves to accomplish a goal such as sustainable use of water resources. Many perspectives on governance exist in the academic literature, reflecting disciplinary orientations, norms and local experiences (Stoker 1998; Van Kersbergen and Van Waarden 2004). Definitional complexity is further complicated by the existence of a host of fields and contexts where governance is a concern. For example, distinct literatures exist relating to *environmental* governance and *global* governance. Major perspectives on governance that exist in the academic literature are explored later in this report. For purposes of this introduction, environmental governance is defined simply as the *processes and institutions through which societies make decisions that affect the environment* (World Resources Institute 2003).

A profound global shift in the way environmental governance occurs is taking place around the world. This shift is sometimes characterized as a transition from *government* to *governance* (Stoker 1998; Sonnenfeld and Mol 2002; Kaika 2003; Pahl-Wostl, *et al.* 2008), and reflects the fact that governments (which collectively are referred to as "the state") no longer are, and in many cases cannot be, the sole source of environmental decision making authority (Bryant and Wilson 1998; Plummer and Armitage 2007b). Instead, through a host of mechanisms that range from markets to co-management arrangements, a diverse range of "non-state" actors (e.g., private sector organizations such as corporations and non-government organizations; public-private partnerships and quasi-governmental boards) now play key roles in environmental governance.

The growing importance of non-state actors in environmental governance reflects a host of considerations including limitations on the capacity of government agencies; pressure from citizens for a greater role in decision making; acknowledgement of the increasing complexity of environmental management, and thus the need for more minds and different kinds of knowledge; and, in the context of developing countries, pressure from international funding agencies (Pahl-Wostl 2004; Armitage 2008; Armitage, *et al.* 2009). The specific reasons for the transformation of environmental governance in particular countries vary widely. Nonetheless, common underlying goals often include moving more effectively towards sustainable development, and responding more successfully to threats and opportunities (World Resources Institute 2003; Biermann, *et al.* 2009).

Shifting from government to governance in the context of the environment is not straightforward. In many respects, societies making this transition are entering uncharted territory, and thus are confronting a host of critical questions. Examples include the following:

- Who should be involved in governance, and how is that decided?
- What roles should the various people and organizations involved play, and how is that determined?
- What is the appropriate scale for decision making (e.g., local, regional or national; administrative units or natural units such as watersheds)?
- Which sources of knowledge will be used in decision making, and how is the validity of different kinds of knowledge evaluated?
- Who ultimately is accountable when governance occurs through multiple organizations at various scales?

These concerns are universal in jurisdictions that are engaged in reshaping environmental governance. Their significance for water governance, in general, and water allocation, in particular, is explored in the following sub-sections.

1.1. Water Governance in Transition

Governance has emerged as a critical concern during the past decade in the context of water (de Loë and Kreutzwiser 2006). This reflects the fact that so many water problems can be traced back to human behaviour, and the fragmented approach that has been taken to managing water resources (Ingram 2008; Biermann, *et al.* 2009). Taking a global view, the United Nations World Water Assessment Programme (UNWWAP) (2003) observed that the world's water crisis is worsening, and that it is, essentially, a crisis of governance caused by the many ways in which we mismanage water. Thus, UNWWAP reports continually stress the importance of both effective *water management* (e.g., building structures to control water flows; gathering data to inform decision making; using water to meet diverse human needs) and effective *water governance* (UNWWAP 2003; 2006; 2009).

Many perspectives on the meaning of the term "water governance" exist. A widely cited definition is offered by the Global Water Partnership (GWP) (GWP 2003, 2), which defines water governance as "the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society." Perspectives on water governance are explored later in the report. For the moment, however, it is important to note the *action-oriented* perspective behind the GWP's definition of water governance. The GWP, and other international agencies such as the UNWWAP, are concerned with governance because they recognize that achieving sustainable water use, securing access to water for all, and balancing economic productivity and environmental protection demands effective governance. Thus, how governance is undertaken – and how the questions posed above are answered – are critical concerns. Effective governance is a prerequisite for solving the kinds of pressing water problems and challenges that confront societies around the world.

1.2. Water Allocation

The transition from *government* to *governance* has emerged as a critical concern in *water allocation*. Water allocation systems are the rules and procedures through which access to water for both consumptive and non-consumptive uses is determined (Tarlock 1988). These systems establish the availability and priority of access to water resources for consumptive uses such as irrigation, cities, and manufacturing, and for non-consumptive uses such as hydropower, recreation and environmental protection. Therefore, they influence economic productivity, social and cultural wellbeing and ecosystem quality (Gleick 1998; Warner, *et al.* 2006). Effective, efficient, and equitable water allocation systems are critical to maintaining and enhancing environmental quality, economic productivity, and social wellbeing. This is especially true where water is scarce and demands are high, for instance, in regions where irrigated agriculture is a major user of water.

Human societies have developed systems to share scarce water resources for millennia (Wescoat 1997; Lightfoot 2009). In North America, several distinct legal traditions provide the foundation for the contemporary systems that exist (Matthews 1984). These include the riparian rights doctrine (surface water), the rule of capture (groundwater) and the prior appropriation doctrine (surface and groundwater), and Quebec's distinct civil code. Under the common law doctrine of riparian rights, riparians (people who own property adjoining rivers, streams and other flowing water bodies) are entitled to use water, but share a responsibility to not compromise unduly the rights of other riparians. Under the doctrine of prior appropriation, rights to use water are based on the time the use began – with earlier users having precedence over later users. The rule of capture exists as a separate legal doctrine for groundwater in many jurisdictions (Tarlock 2005); this reflects the fact that understanding of groundwater was very poor when early legal decisions were being made to resolve disputes over groundwater (Percy 1988; Morris, *et al.* 2008). In most jurisdictions in North America, statutory provisions have been layered onto these doctrines. For example, in Ontario and Minnesota, a statutory permit system has been created to supplement the common law doctrine of riparian rights (Kreutzwiser, *et al.* 2004; Tarlock 2005). In western North America, the prior appropriation doctrine provides the basis for statutory systems in jurisdictions such as North Dakota and Alberta (Percy 1988; Dellapenna 2007).

Water allocation systems in all jurisdictions have evolved in response to changed circumstances and new concerns. In many places, market mechanisms are being used to supplement existing allocation systems, or to replace them. This has important implications for water governance. For example, in Chile under the 1981 National Water Code and the 1988 Constitution, Chile's government transformed its role in water governance (Saleth and Dinar 2000; Bjornlund and McKay 2002). Legally and practically, water is now private property in Chile, independent of land. Under the Water Code and the Constitution, rights to use water are determined through the market, and allocated within and across sectors. Different rights exist for consumptive and non-consumptive users (such as irrigation and power generation, respectively). Conflicts are resolved by Water Users Associations and the courts. State intervention is minimal. Governance for water allocation in Chile is thus widely distributed among a range of state and non-state actors. Australia is another country where long-established prior appropriation systems have been replaced by market-based approaches that involve new kinds of collaboration between States, the Commonwealth government, and locally-organized natural resource management organizations (Bjornlund 2004; Hussey and Dovers 2006).

Historically, water allocation systems were created to deal with a fairly narrow range of concerns – typically related to ensuring that scarce water resources were shared equitably, and put to the most productive economic uses (Percy 1988). Nowadays, however, these systems are expected to address a much wider range of concerns. Societies in many countries now expect that water allocation systems will accomplish the following (de Loë, *et al.* 2007):

- Facilitating economic development through establishing clear and stable allocation rules, while at the same time promoting water conservation and ensuring that aquatic ecosystems are protected.
- Apportioning water equitably among competing users in a transparent and accountable fashion that involves meaningful opportunities for participation in decision making by stakeholders and citizens.
- Recognizing and addressing critical links between surface water and groundwater, and between land use planning and water management, and accounting for the cumulative effects of decisions made in a host of settings.
- Increasing the capacity of individuals, firms, communities and societies to adapt to climate change and to accommodate changed or new demands for water.

The extent to which these concerns can be addressed successfully depends on a host of concerns, including the design of institutions for water allocation (e.g., laws, regulations), technical skills of managers, the availability of data, and political commitment. Whether or not new approaches to governance can build upon existing and well-established approaches to water resource management is one important consideration (Scholz and Stiftel 2005a; Pahl-Wostl, *et al.* 2007b). Another key concern is the extent to which water allocation systems can be integrated with existing and new systems for land use planning, watershed management, and economic development (Carter, *et al.* 2005; Biermann, *et al.* 2009).

1.3. Overview of the Study

The purpose of this study is to develop a state-of-the-art literature review of current academic thinking regarding environmental governance, with a focus on considerations that are relevant to water management and water allocation. The overall perspective is broad, but concerns that are especially pertinent to water and environmental governance in Alberta are emphasized.

The research approach used in the study involved the following main steps:

- A literature review was conducted to identify major concepts and theories pertinent to governance, environmental governance, and water governance. This involved a thorough scan of the contemporary literature using Scopus and the ISI Web of Science to identify major trends and emerging concepts and concerns relating to governance, environmental governance and water governance.

- Canadian and international experiences in water governance were reviewed and analyzed. The goal in conducting this review was to identify real-world experiences that pertain to the major governance concerns identified through the review of academic literature.
- Key water governance challenges faced in Alberta were characterized so that the implications of a shift from government to governance in Alberta can be clearly identified. The goal of this stage was simply to ensure that the issues discussed are relevant to Alberta's current and future circumstances.

The report is organized as follows:

- Section 2 sets the stage by examining water and environmental governance in Alberta. The importance of water for the environment, economy and society of Alberta is highlighted, and shifts in governance are explored (e.g., the increasing role of non-state actors through Water for Life, and the shift to regional land use planning and cumulative effects management that is currently taking place).
- Section 3 reviews the academic literature relating to governance, environmental governance and water governance. Important trends and major themes are highlighted. Key concerns pertinent to environmental governance are then explored.
- Drawing on the foundation established in Section 3, Section 4 explores governance challenges in the specific context of water allocation and management. Experiences from jurisdictions around the world provide the basis for insights regarding how key governance challenges can be addressed. A case study of water allocation in the Murray-Darling Basin, Australia, is used to illustrate the significance of the key concerns in a real-world setting.
- In Section 5, overall conclusions are offered.
- An annotated bibliography of key sources is presented as an appendix in Section 6. The extensive list of references cited (Section 7) is another source of literature for readers interested in following-up on key ideas in the report.

2. Water and Environmental Governance in Alberta

Alberta's water resources are extremely diverse. Median annual runoff ranges from more than 500 mm in the foothills to less than 2 mm in portions of the dry zone north of Medicine Hat (Alberta Economic Development Authority [AEDA] 2008). Patterns of water use are equally diverse. In 2005, 9.563 million dam^3 of water were allocated for various purposes, almost 97% from surface water. Major water users included agricultural irrigation, municipal water supply, rural industries such as food processing plants, stock watering, habitat projects, and energy development. The majority of water used in Alberta has been for agricultural irrigation in southern Alberta, the part of the province where surface water resources are most scarce and least reliable (AMEC Earth and Environmental Limited [AMEC] 2007).

Predicted growth in water demand in Alberta is expected to come primarily from the petroleum sector and oil sands development (to 2010) and then from irrigation (from 2010 to 2025) (AMEC 2007). The extent to which available water resources can meet anticipated demands, especially in already water short regions such as the southern tributaries of the South Saskatchewan River Basin, is uncertain. The combination of growth in demand from expanding uses (urban, industrial, agricultural) and water-related impacts of climate change is likely to have serious negative impacts on water quality and availability in basins across the province (Lapp, *et al.* 2005; Sauchyn 2007; Schindler, *et al.* 2007).

Water-related concerns in Alberta are not limited to water scarcity. For example, water quality is a key concern in the North Saskatchewan region, especially downstream of Edmonton. Impacts of oil sands development in the Athabasca watershed on water quality, water quantity and habitat are a provincial and national concern (Davidson and Hurley 2007; AEDA 2008). Ensuring adequate water is available to meet ecosystem needs is also a concern in many parts of the province (Alberta Environment 2007a).

2.1. Water Allocation and Water Governance

In Canada, provincial governments are responsible for water allocation, and each has devised its own system (de Loë, *et al.* 2007). Alberta's water allocation system has its roots in the *Northwest Irrigation Act* of 1894, a statute created by the Dominion (federal) government to facilitate orderly development of irrigation (de Loë 2005). Under this Act, rights to use water were allocated on a first-in-time, first-in-right basis. Shortly after the Province of Alberta received constitutional authority over natural resources in 1929, it created the *Water Resources Act*, 1931, as a replacement for the Dominion's law. Basic provisions of the Dominion's water allocation system were carried forward into Alberta's *Water Resources Act*, and then into the present law, the *Water Act* (Revised Statutes of Alberta 2000, chapter W-3) that was established following a multi-year review process in the 1990s. Reforms to Alberta's water allocation system in the 1990s included provisions in the *Water Act* to permit temporary and permanent transfers of entitlements, creating the conditions for an emerging water market.

A key challenge in many jurisdictions, including Alberta, is the relationship between water governance and water allocation. Water *allocation* in Alberta remains very much the domain of the provincial government. For instance, decisions regarding the right to use water (through licenses granted under the *Water Act*) are made by provincial officials. However, under initiatives such as the provincial *Water for Life* strategy, water *governance* (more broadly) is becoming increasingly distributed.

Three priorities were established under the Water for Life strategy: (1) a safe, secure drinking water supply; (2) reliable quality water supplies for a sustainable economy; and, (3) healthy aquatic ecosystems (Alberta Environment 2003). Reflecting a commitment to shared governance, new organizations with responsibilities relating to governance were created under Water for Life to help accomplish these priorities. These include a multi-stakeholder advisory body, the *Alberta Water Council*, which provides guidance on the implementation of Water for Life; *Watershed Planning and Advisory Councils*, multi-stakeholder non-profit organizations that bring together stakeholders to provide a watershed-wide perspective and to develop action plans; and *Watershed Stewardship Groups*, volunteer-based citizen groups that engage in environmental stewardship within their local watersheds. These bodies now are part of water governance in Alberta, but they do not have authority over water allocation; this function remains a provincial responsibility, and the Government of Alberta retains ultimate accountability (Alberta Water Council 2007).

A key challenge for Alberta as it continues implementation of the re-authorized Water for Life strategy (Alberta Environment 2008b) is clarifying the relationships that exists between mechanisms for *governance* (such as those created under Water for Life) and regulatory instruments of *government* (such as the water allocation system that exists under the *Water Act*). Specific concerns include determining how the three types of Water for Life Partnerships work together (Alberta Water Council 2008); how Alberta's water allocation system can deal with the kinds of concerns discussed in Section 1.2 (i.e., integration with concerns such as land use planning and natural resource development; support of local, regional and provincial economies; protection of ecosystems; adaptation to climate change); and how institutions for water governance will relate to Alberta's Land-Use Framework (LUF) (Alberta Environment 2008a) and Cumulative Effects Management System (Alberta Environment 2007b).

The LUF is a comprehensive strategy for the management of natural resources and public and private land in Alberta (Alberta Environment 2008a). More broadly, the LUF is meant to be a blueprint for accomplishing economic, environmental and social goals, and for addressing growth pressures. A cumulative effects approach will be used at the regional level to manage the impacts of development on land, water and air. Under the new LUF, plans will be developed for seven regions. The regions correspond roughly to major watersheds in the province. However, because they also are aligned along municipal boundaries they do not correspond exactly to watershed boundaries. As part of the strategy, a Land-Use Secretariat will be created, and Regional Advisory Councils will be established in each of the seven planning region. Members of these councils will be appointed by the provincial government, and will include provincial government officials, municipalities, industry, non-government organizations and Aboriginal communities.

Once the regional plans have been developed and approved by Cabinet, implementation will be the responsibility of the Land-Use Secretariat and government agencies.

The LUF is supported by Bill 36, the *Alberta Land Stewardship Act*. This bill establishes roles and responsibilities, and puts in place the legal authority needed to undertake regional planning. Importantly, the proposed legislation will amend the *Water Act* to require that decisions made under the *Water Act* are in accordance with applicable regional plans made under the *Alberta Land Stewardship Act*.

The *Alberta Land Stewardship Act* does not speak to the relationship between the three Water for Life partnerships and the Regional Advisory Councils that will be responsible for developing the seven regional plans. However, the Land-Use Framework final report (Alberta Environment 2008a) notes that the LUF will complement and link to Water for Life and other provincial strategies. Additionally, it indicates that representatives from relevant planning bodies, including Watershed Planning and Advisory Councils, will be represented on the LUF Regional Advisory Councils.

2.2. Summary

Pressure on water resources in Alberta is intense. Water scarcity and water quality contamination are a concern in several watersheds. Climate change and future economic development are expected to magnify concerns relating to water shortages and contamination. Thus, balancing economic, social and environmental objectives for water is a major challenge.

The Water for Life strategy has changed the way water planning takes place in the province, with new roles for people and organizations outside of government. More recently, the new Land-Use Framework is establishing a regional approach to planning based on cumulative effects management. These mechanisms are part of the ongoing shift from government to governance that is taking place in Alberta. In implementing them, a host of governance challenges are arising. For instance, the relationship between existing regulatory approaches (such as water allocation under the *Water Act*) and new ways of governing (such as the partnerships created under Water for Life) will have to be clear to ensure effective governance. Integration of voluntary, watershed-based planning initiatives with legislated regional planning will be essential, and ensuring that accountability exists among the various planning and decision making forums will be a significant challenge.

3. From Government to Governance

The term "governance" is used in diverse contexts and applications including international relations, the proper functioning of corporate boards, and the manner in which societies should address environmental problems. This section provides an overview of the academic literature relating to governance. It is organized as follows:

- Section 3.1 introduces the broad perspective of governance that is found in the literature of political science and related fields, including international relations and global governance.
- In Section 3.2, the focus shifts to *environmental* governance, a topic around which a distinctive body of literature has developed. This literature is rooted in notions of governance presented in Section 3.1, but a host of additional concerns are addressed. Idealized governance models are described in this section, as is the trend towards hybridization.
- Building on this foundation, Section 3.3 discusses six critical concerns that are especially pertinent to environmental governance.

3.1. Governance in Political Theory and International Relations

Recent interest in governance in the academic literature originates primarily with social scientists concerned with the changing manner of governing (Jessop 1998; Stoker 1998), critical questions about the relationships that exist among the public sector and other actors in advancing societal aims (Glasbergen 1998; Dean 2007) and the need to address interdependent global relations and processes (Rosenau 1999; Vig 2005). In this section, attention focuses on the transition from *government* to *governance* that is underway in countries around the world. As noted in Section 1, this transition is reshaping the ways in which societies are thinking about and dealing with the environment.

Anglo-American political theory conventionally uses the term "government" to refer to formal institutions of the state, their power, and the processes by which they function to ensure order and protect collective interests (Stoker 1998). Dictionary definitions of the term "government" often list *governance* as a synonym (Stoker 1998). This is logically consistent with the etymology of the term governance, which refers to the "steering" or "guiding" of public affairs, a function that historically has resided with the state (Jessop 1998).

In the scholarly literature, in contrast to in dictionaries, the term "governance" has taken on more nuanced meanings. During the past two decades, governance has become a major concern in numerous fields in political science, including international relations, public sector management, and corporate governance (Van Kersbergen and Van Waarden 2004). Indeed, a recent survey of the literature suggests that governance has become a "growth industry" (Van Kersbergen and Van Waarden 2004). Not surprisingly, therefore, many definitions of the term can be found in the academic literature (Box 1).

A common theme in contemporary academic writing about governance, regardless of the specific focus, is the notion that governance is goal-oriented and involves deliberate interventions in society (Kooiman 1993). This is reflected in Glasbergen's (1998) characterization of three elements common to governance:

- Governance involves relationships between objects and subjects that are often dichotomous, for instance, government and society, public to private, state to market. The various perspectives on governance that exist in the literature define these relationships in different ways.
- A desire to bring about change in the relationship between object and subject in some way is a basic feature of governance, e.g., to redefine the relationship between government and society, or between state and market.
- Perspectives on governance include conceptualizations of the social milieu or context in which the desire to bring about change occurs. This typically involves ideas about what is needed for effective governance.

Definitions of governance presented in Box 1 reflect these three basic elements, and highlight the different ways in which they can be combined. For example, *global governance* is concerned with world problems, international politics, interdependencies brought about by globalization and development issues (Kjær 2004; Dingwerth and Pattberg 2006). Reflecting this pattern, the definition of global governance offered by Rosenau (1999) in Box 1 speaks to relationships between the state and society, and between all kinds of human activities that occur at levels from the family to international organizations. A strong normative or moral dimension is common in this literature. For instance, Dean (2007) points to the remoralization of conduct by international actors as well as increased scrutiny of the actions of states. This is reflected in concern for governance in entities such as the United Nations, the World Bank, the International Monetary Fund and the Organisation for Economic Co-operation and Development. Global governance literature related to globalization, development and the environment has specifically focused on benchmarks of "good" public governance such as principles of accountability, transparency, responsiveness, equity and inclusion, effectiveness and efficiency,

Box 1: Selected Definitions of Governance

- Governance refers to self-organizing, interorganizational networks characterized by interdependence, resource-exchange, rules of the game, and significant autonomy from the state. (Rhodes 1997, 15)
- Governance broadly is the setting, application and enforcement of the rules of the game. (Kjær 2004, 12)
- Governance is the institutional capacity of public organizations to provide the public and other goods demanded by a country's citizens or their representatives in an effective, transparent, impartial, and accountable manner, subject to resource constraints. (World Bank 2000, 48)
- Governance is intended to include the entire range of activities of citizens, elected representatives, and public professionals as they create and implement public policy in communities. (Box 1998, 2)
- Global governance refers to systems of rule at all levels of human activity – from the family to the international organization – in which the pursuit of goals through the exercise of control has transnational repercussions (Rosenau 1999, 13)

following the rule of law, and participatory, consensus-oriented decision making (Crabbé and LeRoy 2008; United Nations Economic and Social Commission for Asia and the Pacific 2009).

Despite the many different perspectives on governance that exist in the literature, there is broad agreement around one trend: the boundaries between and within the public and private sectors are becoming blurred as new styles of governing emerge (Stoker 1998; Van Kersbergen and Van Waarden 2004). As a result, new ways of governing, and the relative effectiveness of different governing styles, are an important concern in the literature (Jessop 1998; Stoker 1998).

The governance literature is not simply a source of abstract frameworks and critiques of existing practices. Rather, the literature offers a foundation of empirical examples and theoretical conceptualizations that permit sensible decisions about what can be done, and what should be done, to improve governance in a host of settings. This is particularly true in the case of the environmental governance literature, where goal-oriented action is a key concern.

3.2. Environmental Governance

Environmental challenges are substantial and have profound implications for human societies. In one of the most comprehensive and multi-scale assessments of these challenges, the Millennium Ecosystem Assessment (2005) has concluded that in the last half century humans have altered ecosystems more quickly and extensively than ever before; that gains in well-being for humans have come at increasing costs for future generations; that ecosystem degradation is a barrier to achieving Millennium Development Goals and could worsen considerably; and that options exist to reduce the situation, but will require humans to change their behaviour substantially.

How the environment is understood is also changing. Increasingly, analysts are viewing the environment as a complex adaptive system that is characterized by transformative changes and uncertainty (Levin 1999; Holling, *et al.* 2002), a setting in which boundaries between ecological systems and social systems are dissolving (Berkes, *et al.* 2003). As Glasbergen (1998, 1) observes, “environmental issues have given new impetus to the debate on the opportunities and limitations of managing social change.” From this perspective, the environment is not external to society. Rather, quality of life and the strength of economies are dependent on environmental conditions. Reflecting this concern, the concept of “social-ecological systems” is prominent in contemporary environmental governance literature. This term refers to systems of people and nature, where social and ecological processes are inextricably interrelated.

The conventional “command and control” approach to environmental problems (discussed below) has had some remarkable successes in the twentieth century. However, serious limitations of this approach are evident. Common concerns in the literature include substantial compliance and enforcement costs, conflicts and polarization associated with regulations, and limited effectiveness in addressing problems characterized by complexity and uncertainty (Holling and Meffe 1996; Kettl 2002; Durant, *et al.* 2004). These problems contribute to the interest in new ways of governing, and have led to a profound shift concerning environmental issues and policies around the world. Environmental governance (like governance generally) is also being characterized by the transition from government to governance (Sonnenfeld and Mol 2002; Himley 2008; Pahl-

Wostl, *et al.* 2008). As noted earlier, this reflects acknowledgement of the fact that governments are not, and cannot be, the only source of environmental decision making authority (Bryant and Wilson 1998; Plummer and Armitage 2007b). At the same time, it reflects a desire to make a stronger connection between science and environmental policy (Holling, *et al.* 2002; Parliamentary Commissioner for the Environment 2004), and to take advantage of new understandings of complex adaptive systems, which are characterized by transformative changes and uncertainty (Duit and Galaz 2008). Concern for environmental governance thus has the potential to influence the ways in which decisions regarding the environment are made in the twenty-first century (Kettl 2002; Durant, *et al.* 2004; Plummer and Armitage Forthcoming).

Environmental governance is a specific form of the broader phenomenon of governance that was described in Section 3.1. Environmental governance encompasses the three fundamental elements of governance described by Glasbergen (1998). However, the normative dimension common to governance is usually framed as *sustainability* (Hempel 1996; Adger, *et al.* 2003; Folke, *et al.* 2005), and thus an emphasis on sustainability science is common in the literature (Berkes, *et al.* 2003; O'Connor 2006; Blackstock and Carter 2007). As may be expected in a relatively young field that is growing rapidly, the environmental governance literature can be nebulous at times (Ali-Khan and Mulvihill 2008).This is evident in the various definitions of environmental governance presented in Box 2.

Box 2: Selected Definitions of Environmental Governance

- Environmental governance refers to the set of regulatory processes, mechanisms and organizations through which political actors influence environmental actions and outcomes. (Lemos and Agrawal 2006, 298)
- Environmental governance should be understood broadly so as to include all institutional solutions for resolving conflicts over environmental resources. (Paavola 2007, 97)
- Earth system governance is defined here as: The interrelated and increasingly integrated system of formal and informal rules, rule-making systems, and actor-networks at all levels of human society (from local to global) that are set up to steer societies towards preventing, mitigating, and adapting to global and local environmental change and, in particular, earth system transformation, within the normative context of sustainable development. (Biermann, *et al.* 2009, 3)

Differences in definitions aside, several key ideas are common throughout the environmental governance literature. These include the following:

- Consideration of novel and innovative institutions, institutional arrangements and incentives which facilitate collective action (Lemos and Agrawal 2006; Ostrom 2007; Ali-Khan and Mulvihill 2008; Armitage, *et al.* 2009).
- The importance of non-state actors due to the limited capacity of government agencies, pressure from citizens for a greater role in decision making and benefits from involving more minds and different kinds of knowledge (Pahl-Wostl 2004; de Loë and Kreutzwiser 2006; Armitage 2008; Himley 2008; Armitage, *et al.* 2009).
- The manner in which environmental governance is made operational in the context of environmental challenges (e.g. complex adaptive

systems, social-ecological systems) and connections across scales (Dietz, *et al.* 2003; Folke, *et al.* 2005; Lemos and Agrawal 2006; Ostrom 2007; Pahl-Wostl and Jeffrey 2008; Biermann and Pattberg 2008). See also Box 3.

Models of Environmental Governance

In bringing the foregoing discussion together, it is useful to consider Glasbergen's (1998) argument that conceptualizations of governance are concerned both with what could be and what should be. All styles or modes of governance are grounded in norms and desired objectives that reflect assumptions about how society should be organized, how problems should be addressed, and by whom. Glasbergen (1998) correctly notes than an abundance of governance models exists, and that these models incorporate assumptions about how and why change should occur. In that sense, different ways of governing incorporate different answers to the questions posed in Section 1.

Five main governance models that are prevalent in environmental policy are identified, described and critically assessed in Table 1. For simplicity, the models are presented as ideal types, although in reality the boundaries between them fade, and in most contexts these ideal models are usually combined. Which combinations of these models are most appropriate is dependent primarily on the specific situation and context, and the issues at hand. This notion is developed in more detail in the next sub-section, and is illustrated in Section 4.2 using the case of water governance in the Murray-Darling Basin, Australia.

Box 3: Scale, Social-Ecological Systems and Governance

Spatial and temporal scales are critical

Scale provides a conceptually useful tool as it helps to define how components in different spatial and temporal contexts are related to one another, and can suggest how external factors will alter social and ecological systems. For example, ecosystem inputs, outputs, material cycling and interactions, and the interaction of humans within ecosystems, occur over an incredible array of spatial and temporal scales and hierarchies. Administrative or political scales pose a similar challenge and are also characterized by interactions of variables (e.g., macroeconomic policy, prices, values, worldviews, property rights, etc.) operating in different spatial and temporal domains.

Social-ecological systems are dynamic in space and time

Integrated systems of people-in-nature are continuously changing over temporal scales of centuries or more. Most observable or detectable ecosystem phenomena (i.e., the change we can more easily measure) occur in the context of continuous, long-term change associated with biological generations and geological time-scales. Empirical studies demonstrate that ecosystems either lack equilibrium, or that equilibrium conditions are observed only at a particular temporal and spatial scale. Thus, ecosystem organization and function may be characterized by homeorhetic stability (i.e., they return to a trajectory), rather than homeostasis (i.e., they return to some pre-disturbance state) (Christensen, *et al.* 1996). From a social perspective, centralized governance models are not always suited to these dynamics, encouraging many to call for distributed (i.e., roles for state and non-state actors), adaptive and redundant institutional arrangements (Dietz, *et al.* 2003; Folke, *et al.* 2005).

Table 1: Generic Models of Governance in Environmental Policy

Model	Orientation	Key Characteristics	Assumptions	Strengths	Weaknesses
Regulatory	Law	• Governments are the regulators • Change occurs through the alteration of rules and policies • Starting model for environmental policy	• Society is manageable (people will follow rules and regulations)	• Clear rules for action • Basis for retribution • Adherence can lead to improvements • Standardized policies and mechanisms applicable to a broad geographic area	• Reactive in nature • Unclear ability to address uncertainty and complexity • Requires monitoring and enforcement • Cost effectiveness is uncertain • Economic growth may be restricted
Market Regulation	Economics	• Price mechanisms provide control and are facilitated by governments • Change occurs by reconfiguring price mechanisms	• Markets can resolve environmental problems through price signals • Aggregating individual preferences in a market leads to socially optimum outcomes	• Integration of ecosystem services into markets • Recognition of the full cost of production • Behaviour is altered by making choices with negative impacts less financially attractive	• Price mechanism may not be able to accurately incorporate environmental externalities • Relatively few examples in practice • Form of regulation • Accountability concerns
Civil Society	Political Science	• Engaged citizens play a dynamic role in civil society • Change occurs through dialogue and debate	• An informed and engaged citizenry exists and is willing and able to play a role • Critiquing governments can induce strong environmental policy	• Public participation enhances legitimacy • The connection between personal actions and environmental impacts is highlighted	• The assumption that public debate will result in positive policy improvements is questionable • Potential for "productive conflict", where ideas are exchanged and debated openly, is ignored

Model	Orientation	Key Characteristics	Assumptions	Strengths	Weaknesses
Co-operative Management	Political Science	• An array of actors (e.g., government, non-governmental organizations, private) interact in a collaborative manner • Communication and dialogue is the basis for the voluntary agreements • Focus is on organized interests, rather than on individual citizen participation	• Actors are willing and able to act in a collaborative manner • The world is complex and uncertainty is high	• Encourages pluralistic inputs and can lead to effective and efficient processes • Strives to make mutual dependencies productive, incorporate multiple knowledge systems and is a mechanism for building consensus • Coordinated and complementary effort to assert change • Stresses flexibility and learning, which is well suited to complexity and uncertainty	• Power differentials between actors and what the actors represent • No guarantee for efficiency gains • Negotiated and deliberative process take considerable time and resources • Incompatible with some political cultures • Insufficient capacity undermines effective participation
Contextual Control and Self-Regulation	Law and Political Science	• Sub-systems or actor networks form and address environmental issues • Network formation is an outcome of self-reflection regarding appropriate actions for the social context and the environmental challenges • Governments intervene to provide corrective measures when necessary	• Actor networks will form and engage in appropriate self-regulatory behaviour	• Resistance to government driven policy is mitigated • Highly democratic and fosters engagement	• Blatant protection of self-interests is possible • Government may be required to take corrective action • Ideal of self-regulation may be illusionary in light of extensive legal preconditions

Source: Adapted from Glasbergen (1998) and Meadowcroft (1998)

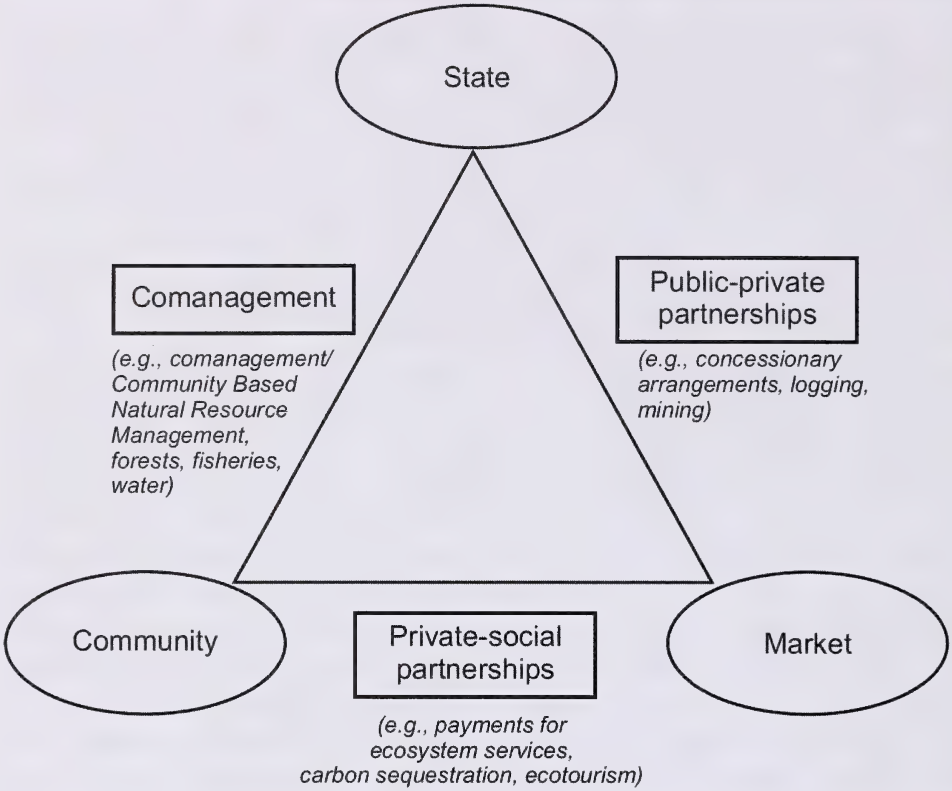
Environmental Governance Dynamics and Hybridization

Thus far the discussion of governance, environmental governance and key environmental governance concerns has dealt with the theory and application of idealized concepts. However, it is critical to recognize that environmental governance is dynamic and being reconfigured in a multitude of ways. For example, the models of environmental governance presented in Table 1 are not mutually exclusive and often work together. To illustrate, Meadowcroft (1998) argues that the co-operative model of governance will not replace existing regulation. Instead, the co-operative model of governance can work effectively within a system of government regulations and is compatible with the market model. This point is reinforced through a case study of water governance in the Murray-Darling Basin, Australia, presented in Section 4.2.

In reconceptualizing environmental governance, Paavola (2007) argues that an inclusive view is required with a focus on institutional design solutions. Alternative institutional forms of governance are emerging as conventional models of governance give way to hybridization (Lemos and Agrawal 2006). Lemos and Agrawal (2006) illustrate this phenomenon with a schematic (Figure 1) that positions three of the idealized governance models (state, market and community) in relation to nuanced or hybridized forms that cross the boundary between two of the governance models. Building on this idea, Duit and Galaz (2008) draw attention to the idea of multilevel governance to emphasize that governance occurs through both processes and institutions across scales (e.g., geographic, organizational). They argue that governance scholars need to shift their focus from examining novel patterns of governance to "a research agenda that elaborates the problem-solving capacity of existing multilevel governance systems in the face of change characterized by nonlinear dynamics, threshold effects, and limited predictability" (Duit and Galaz 2008, 329).

In moving beyond the idealized models, hybridized forms of environmental governance are concentrating on innovative mechanisms or strategies to promote change. Lemos and Agrawal (2006) identify three major strategies for environmental governance that illustrate this trend: co-management, public-private partnerships and private-social partnerships. Even within these strategies, further hybridization and refinements are evident. For example, focusing on the linking and trust building functions of collaborative management, and on flexible and social learning aspects of adaptive management, has led to the emergence of *adaptive co-management* (Plummer and Armitage 2007b; Armitage, *et al.* 2009). Another perspective is offered by researchers concentrating on opportunities associated with multi-level, polycentric and/or "networked" governance arrangements (Folke, *et al.* 2005; Sørensen and Torfing 2007; Provan and Kenis 2008). Tensions and limitations are also evident from experiments with this prolific hybridization. To illustrate, Wallington and Lawrence (2008) argue that local concerns can be undermined when the focus is primarily on ensuring that communities are accountable to central government priorities. Lemos and Agrawal (2006) identify several concerns relating to hybridized strategies, including how power is used to gain access to resources, and the potential for a "democratic deficit" when market mechanisms are emphasized.

Figure 1: The Hybridization of Environmental Governance: An Illustration


State
Comanagement
(e.g., comanagement/ Community Based Natural Resource Management, forests, fisheries, water)
Public-private partnerships
(e.g., concessionary arrangements, logging, mining)
Community
Private-social partnerships
(e.g., payments for ecosystem services, carbon sequestration, ecotourism)
Market

Source: Lemos and Agrawal (2006)

Table 1 presented a relatively neat set of "models". In contrast, the notion of hybridization emphasizes that in the real-world of environmental governance, there are no simple models or neat categories. The transition from government to governance represents a profound shift in ideas, the identification of challenges, and the recognition of opportunities. Thus, instead of simplistic models there are virtually endless combinations and permutations that reflect a better understanding of the functioning of interconnected social and ecological systems, along with a clearer sense of real world environmental conditions, and socio-economic, historical, and cultural circumstances. To illustrate, Box 4 provides a brief case study of environmental governance in the context of the Kristianstads Vattenrike, Sweden. Experiences in this case offer numerous insights into the ways in which different governance strategies can be used. However, the extent to which lessons and insights from cases such as this are transferrable must be determined on a case-by-case basis. Institutions for governance are not easily transferred between jurisdictions because they are embedded in particular historical, political, biophysical and socio-economic circumstances (Saleth and Dinar 2000; Pigram 2001; Mossberger and Wolman 2003; Allan 2003a).

Box 4: Environmental Governance in Kristianstads Vattenrike, Sweden

The Kristianstads Vattenrike area of Sweden is a vast wetland (110,000 ha) located in the Municipality of Kristianstad. The area includes the Helgeå River (draining a catchment of 4,775 km^2) and is steeped in rich cultural values relating to the tradition of using flooded meadows for agriculture and the wetlands historically for tactical military defense around Kristianstad. In recognition of the ecological and social significance of these values, the lower portion of the wetland was designated as a Ramsar Convention Site in 1975. Despite this protection, the Kristianstads Vattenrike continued to come under increasing pressure for agricultural production, source water provision, recreation activities, and ecosystem services.

In the early 1980s a key individual (SEM) recognized the decline in values associated with the area and began documenting changes associated with it, which led to development of a broader cultural heritage program (kulturminnesvårdsprogrammet) by the Municipality of Kristianstad between 1986 and 1989. Realizing the potential crisis and increasing number of individuals and organizations concerned with improving management of the area, SEM cultivated relationships with central individuals from key organizations and gained support to connect several projects. In response to these disappearing values and the growing support, the Ecomuseum Kristianstads Vattenrike (EKV) was formed in 1989 with the purpose of fostering collaborative efforts to manage the ecosystems of the Kristianstads Vattenrike. Since formation it has functioned as an informal (no enforcement power) and flexible organization, which connects actors across societal levels. The EKV has since followed up on the initial mapping of flooded meadows and has undertaken a number of projects such as additional inventories, more mapping, and further monitoring. This commitment to understanding the social-ecological system, gathering feedback and continuing collaborative efforts has permitted the EKV to respond to changes and undertake an expanded scope and repertoire of projects.

The Kristianstads Vattenrike is one of the most extensively and longest studied cases of hybridized environmental governance involving the community and the state. It is an excellent example of adaptive co-management. Attention has focused extensively on understanding how this adaptive governance strategy occurred. Olsson and colleagues have discerned three particular phases: preparation, in which knowledge, relationships and networks are cultivated; window of opportunity, in which a ‘policy window’ presents itself as a chance for innovation; and, build resilience, in which the EKV facilitated the development of networks, linkages and learning. Findings from research of this case enhance understanding of the importance of accessing social memory via networks, the roles of bridging organizations that can work across levels and connect clusters of networks, and ultimately the possibility to address issues at multiple scales and enhance social-ecological resilience.

Sources: (Olsson, *et al.* 2004; Hahn, *et al.* 2006; Olsson, *et al.* 2007; Olsson 2007)

3.3. Key Concerns Pertinent to Environmental Governance

Current environment-society dilemmas require innovative governance approaches (Berkes, *et al.* 2003; Dietz, *et al.* 2003), such as those explored above. This conclusion emerges from a host of well-document problems with traditional approaches:

- New strategies are needed due to value and interest disputes, the cross-scale nature of environmental problems (see Box 3), and resulting ecological and social uncertainty (Funtowicz and Ravetz 1993; Holling and Meffe 1996).
- Conventional assumptions about social and ecological stability, scientific certainty, and the place of experts in governance increasingly are recognized as incomplete.
- Centralized bureaucracies are often limited in their ability to respond to environmental and social change, or reflect the values and interests of citizens and non-state actors as economic conditions change and as public opinion evolves.
- Hierarchical and overly bureaucratic arrangements that reflect "stovepipe" or silo thinking (Pinkerton 2007) may restrict integrated understanding, and usually limit the types of knowledge used for decision making. Additionally, these kinds of arrangements may be poorly positioned to deal with surprise and discontinuity (Levin 1999).
- Limitations with yield-oriented, "command-and-control" governance are widely documented in the literature.

Emerging governance approaches, in contrast, draw attention to group decision making that accommodates diverse views, networks and hybrid partnerships among state and non-state actors, shared learning, and the social relationships that provide opportunities for adaptability and positive transformation (Folke, *et al.* 2005). Environmental governance has evolved considerably over the past decade as a result of these combined insights.

Key concerns prominent in the academic literature are synthesized in a series of boxes relating to the following topics:

- Accountability and legitimacy (Box 5)
- Actors and roles (Box 6)
- Fit, interplay and scale (Box 7)
- Adaptiveness, flexibility and learning (Box 8)
- Evaluation (Box 9)
- Knowledge (Box 10)

The discussion relating to each key concern draws on a broad range of theorists and practitioners with diverse disciplinary starting points (e.g., political science, sociology, geography, environmental studies, and economics) as well as those operating in interdisciplinary terrain. In each box, literature is synthesized with three objectives in mind: (1) to identify and present the pertinent issues and language associated with emerging concepts about environmental governance;

(2) to define and describe issues as they are used in the academic literature; and (3) to highlight why these issues are central to an evolving understanding of environmental governance. Literature used in preparing each box is identified. Table 2, following the boxes, summarizes the main insights.

Box 5: Accountability and Legitimacy

Accountability and legitimacy are core challenges in the transition from government to governance. Accountability is the acknowledgement and assumption of responsibility. Legitimacy is the approval of institutions or actors by those subject to its actions. Accountability and legitimacy of action may be defined in law. Increasingly, however, accountability and legitimacy in multi-actor and networked governance are outcomes of experience, history and trust among actors. Accountability, specifically, emerges from (1) clearly defined roles and responsibilities; (2) the presence of consequences in regards to performance and effectiveness of roles and responsibilities; (3) responsiveness to other actors; (4) sets of checks and balances and transparency; and (5) the free flow of information and open systems of communication.

In a formal governance arrangement, legitimacy emerges with the consent (often tacit) of those being ruled. However, in multi-actor or networked models of governance, where responsibility and accountability are dispersed among a variety of actors (local, regional, private, public), legitimacy may often be non-formal (i.e., not defined in law). Legitimacy achieved through relationships of trust and equity is recognized as valid and relevant in confronting environmental dilemmas.

The introduction of multiple actors in the governing process raises new issues with regards to accountability and legitimacy. Electoral and hierarchical accountability (e.g., as in traditional top-down governing) may be inadequate to capture the complexity of distributed roles, such as in market-based or cooperative governance models. Pluralist forms of accountability are stressed that provide greater legitimacy through acceptance of new actors and the formation of horizontal and vertical linkages. Measures for collective and individual accountability for governance actors are suggested. Examples include professional/peer, public reputational, market, fiscal/financial and legal accountability, in addition to process measures such as transparency, responsiveness, outcomes, priority setting, monitoring and communication.

The need for a multi-dimensional model of accountability and legitimacy is encouraged, as is the recognition of trade-offs with each governance model (Table 1) in terms of achieving accountability and legitimacy thresholds.

Sources: (Agranoff and McGuire 2001; Rogers and Hall 2003; Skogstad 2003; Van Kersbergen and Van Waarden 2004; Benner, *et al.* 2004; Bernstein 2004; Blomquist and Schlager 2005; Lebel, *et al.* 2006; Paavola 2007)

Box 6: Actors and Roles

The transition from government to governance implies the participation of diverse sets of non-state actors in the process of steering society, as well as changing perspectives of actor roles and responsibilities (e.g., the role of the state transitioning from holder of expertise and decision maker, to facilitator, and knowledge and decision broker). The rationales for participation of a greater array of non-state actors include increased legitimacy, more effective and efficient governance (e.g., in terms of allocating resources), and improved access to knowledge and expertise.

How authority (accountability, legitimacy) is granted to non-state actors is recognized as a fundamental challenge in the shift from government to governance. Therefore, better identification and clarity concerning strategies to incentivize participation of non-state actors (e.g., through financial, decision making power, etc.) is required. Historical failures to provide appropriate incentives (limited or weak participation) requires new forms of assurance for non-state actors that participation can lead to tangible, meaningful results.

A concern with ambiguity about roles associated with a growing number of actors generates different perspectives. For some, clearly defined roles and the interaction and responsibility between actors is required to ensure expertise, skills, and abilities are utilized to their full potential, and in the most efficient manner. There is an implication that ambiguity of roles creates weak governance systems, with important functions (communication, information gathering, enforcement) poorly implemented as an outcome of poorly delineated responsibilities. For others, well-defined actor roles (state and non-state) are important. Nonetheless, uncertainty and cross-scale effects (Box 7) point to the need for redundancy and layering of roles.

Devolution (as opposed to deconcentration) of power and responsibility works best where formal policy and regulatory support (i.e., from the state) is provided. However, a lag effect in terms of social acceptance of devolution of powers to non-state actors is evident in many jurisdictions creating challenges for effective governance outcomes. Related to this (see below) is a fundamental concern with how devolution to non-state actors may produce potential equity and distributive conflicts and additional or new transboundary problems. There also remains a need to establish empirically the strength of these suppositions given the time commitments involved and the effect (covert and tacit) of power.

Regardless of the governance model used, one of the more recent directions in environmental governance scholarship is recognizing the importance of boundary or bridging organizations. Boundary organizations (the concept has been applied to individuals as well) provide critical links between, for example, science and policy or communities and the state. They may have specialized roles but can function across or outside these roles. As well, they have clear responsibilities to actors on either side of the boundary, and importantly, they provide the context for sense-making about key challenges and the co-production of knowledge to address those challenges.

Sources: (Singleton 2002; Dietz, *et al.* 2003; Savan, *et al.* 2004; Parliamentary Commissioner for the Environment 2004; Ansell and Gash 2008)

Box 7: Fit, Interplay and Scale

Ecological and social systems are interconnected and nested. Thus, few environmental challenges can be resolved by governance arrangements that ignore these relationships, or operate at only one scale. Reflecting awareness of the importance of scale, state and non-state actors at scales from the local to global are increasingly involved in governance. Linkages among these actors confer greater capacity for monitoring, understanding feedback and encouraging appropriate incentives. Specific and on-going challenges to society as a result of scale include (1) ignorance of the cross-scale and cross-level (within-scale) interactions of human-environment systems; (2) consistent mismatches between natural system scales and human management scales; and (3) erroneous attempts to define a single appropriate scale or level at which to operate. Efforts to govern human-environment systems are often weakened as a result of failure to give attention to cross-scale and cross-level issues.

Concerns about "fit" and interplay are gaining prominence in the context of environmental change. Certain problems of fit are fairly well understood, if not easily overcome. These include spatial fit (finding the appropriate spatial connection between governance and the environmental problem) and temporal fit (the inability to respond to external disturbances in timely manner, such as rapid declines in water flow). More recently, problems of fit have been identified in association with (1) threshold behaviour, when governance systems are unable to avoid irreversible shifts in system functioning with consequent loss of ecosystem services (e.g., coastal resource declines with profound livelihood, ecological implications); and (2) cascading effects where governance actors are unable to buffer the flow of crises across scales and systems (e.g., climate change, rapid sea ice loss, marine mammal decline, and livelihood impacts on indigenous people).

Hybrid governance models to address problems of fit emphasize building stronger horizontal and vertical linkages. In particular, considerable attention is being devoted to multi-level arrangements that highlight task-specific, intersecting actors in flexible institutional designs spanning many jurisdictional levels. This form of multi-level arrangement may have multiple centres of decision making and many mechanisms for coordinated action. Authority may be distributed and does not reside at a single level. The concept of multi-level governance to deal with fit and scale mismatch leads to governance involving nodes and links, or, networks of actors across scales (e.g., from local users, or industry to municipalities to regional and national or international organizations). Each actor is expected to play a key role in better coordinating actions, improving information flows, and synthesizing and mobilizing knowledge.

Networked arrangements are presumed to confer adaptability and stability on the institutional system because of enhanced capacity to diffuse negative effects and distribute benefits. However, numerous challenges with multi-level arrangements are identified in the literature. In addition to accountability concerns (see above), problems of vertical and horizontal interplay can generate constraints to integration and/or create excessive organizational complexity.

Sources: (Gibson, *et al.* 2000; Ostrom, *et al.* 2002; Dietz, *et al.* 2003; Hooge and Marks 2003; Cash, *et al.* 2006; Moss 2007; Pahl-Wostl, *et al.* 2007b; Pahl-Wostl, *et al.* 2008; Young, *et al.* 2008)

Box 8: Adaptiveness, Flexibility and Learning

Stability in environmental governance processes is generally a desirable property. However, tension exists between the desire for stable institutions and the need for governance processes to be flexible and adaptive in the face of change. With roots in adaptive management, a growing body of environmental governance literature emphasizes the importance of adaptiveness. Recognition that human-environment systems are characterized by uncertainty and change, an adaptive approach involving continuous monitoring and feedback can provide the requisite flexibility to deal with change. In an adaptive governance framework, policies are viewed as experiments which will require modification as new knowledge and understanding is gained.

Interest in adaptiveness has been catalyzed by ongoing developments within complex systems theory that highlight the importance of building resilience in social-ecological systems. Recent examinations of environmental governance have focused on investigating institutional and other variables that determine how governance systems facilitate or constrain adaptation. Interest in environmental governance research is evolving, therefore, toward the analysis and design of governance systems with "adaptive capacity". Such governance systems, it is thought, will be better able to deal with current and projected uncertainties stemming from ecosystem and socio-economic change.

Adaptive governance approaches raise issues concerning the effects of unequal power among governance actors (e.g., who is expected to adapt and at what cost), inflexibility in current governance models that may resist efforts to learn from feedback, and the challenges of ensuring effective integration of learning outcomes into governance processes and structures. As a characteristic of environmental governance, adaptiveness derives from a dynamic and ongoing process of social learning, a concept that has been the focus of interest in a wide range of disciplinary and organizational contexts (e.g., business, education, natural resource management). As a social process and outcome, learning is achieved through the collaborative and mutual development and sharing of knowledge by multiple actors (see below). Empirical studies of social learning in environmental governance draw attention to how learning occurs (individually and collectively), and the importance of institutional arrangements that stabilize and transmit learning outcomes. This has led to a re-emphasis on the importance of multi-level institutional arrangements that build vertical and horizontal linkages to cope with change and to respond to feedback.

Participation of multiple actors (state, non-state, public, private) is considered to be fundamental to effective and collaborative learning, and to the effective transmission of knowledge, perspectives and insights from individuals to larger groups involved in environmental governance. Attention is directed at who is learning (individual, group), learning theories (e.g., experiential, transformative, social) and multiple loops of learning as part of environmental management and governance (e.g., single, double and triple-loop learning). Experiences with social learning as a key issue for adaptiveness in environmental governance highlight the importance of learning-by-doing through iterative practices, evaluation and modification of behaviour.

Sources: (Lee 1993; Clark 2001; Folke, *et al.* 2002; Westley 2002; Folke, *et al.* 2005; Armitage 2008; Armitage, *et al.* 2008; Biermann and Pattberg 2008)

Box 9: Evaluation

The importance of evaluation and assessment is well-established in the governance literature, and is closely connected to monitoring. On balance, however, the actual application and systematic treatment of evaluation is inadequate. The extent to which evaluation focuses primarily (or only) on phenomena that can be measured is a particular concern.

In environmental governance, recent directions in evaluation and assessment encourage processes that involve constructive interactions among governance actors to examine trade-offs among different initiatives, to understand key outcomes, and to use evaluation and assessment as the basis for collaborative learning. The value of different organizations helping to shape the evaluation questions, defining outcomes to be assessed, and using participatory processes in evaluation implementation, indicator development and monitoring processes is emphasized in the literature. Considerable emphasis is placed on a recognition that environmental governance involves interactions across multiple scales of activity and an increasingly complex set of actors (state and non-state), making evaluation and assessment particularly challenging.

A recent theme relating to evaluation in environmental governance is the call for a "diagnostic approach", based on experiences in the health field where evaluation is used to identify critical factors and their linkages. A diagnostic approach is considered to be of potential value to supporting better understanding of trade-offs among governance processes, and to improving coordination. Nonetheless, it also is recognized that diagnostic approaches are not a panacea.

Where evaluation and assessment of *process* outcomes in environmental governance are often stressed, outcomes concerning *ecosystems and economic impacts* have received less attention. Emerging systems-based frameworks for evaluation and assessment are beginning to account for complexity. In this regard it is possible to define broad parameters for evaluation that can be used to help define context-specific indicators that help actors respond to feedback (e.g., price signals, livelihood vulnerability, etc.). Examples include *ecological* (ecological components, relationships and functions, diversity, memory and continuity), *economic* (increased well-being, decreased poverty, increased income, decreased vulnerability, increased food security, sustainable resource use), and *process* (collaboration, communication and negotiation, social learning) parameters.

Matching indicators for evaluation and assessment to the different scales of environmental governance is technically and financially challenging. Additionally, care is needed in selecting indicators because those appropriate for larger systems such as regions may not be appropriate at community levels. At the same time, as noted earlier, it is important to ensure that evaluation does not ignore key phenomena at the expense of measuring that which is measurable.

Source: (Bellamy, *et al.* 2001; Conley and Moote 2003; Garaway and Arthur 2004; Ostrom 2007; Plummer and Armitage 2007b; Wallington and Lawrence 2008)

Box 10: Knowledge

Environmental governance in its multiple and hybrid forms is information intensive. Knowledge of complex and changing social and ecological systems is required to facilitate evaluation and assessment processes, to respond to feedback in support of learning, and to enable effective allocation decisions. Knowledge to meet these needs is widely distributed among local, regional and national (including international) actors. No individual actor – state or non-state – will have the full range of knowledge required to support effective environmental governance.

The value in drawing from multiple sources of knowledge, including knowledge from formally-trained scientists, policy makers and managers, as well as resource users (agriculture producers, fishers, hunters, etc.) has been established empirically. However, rather than using knowledge of diverse groups to generate information and understanding through reductive mechanism, emphasis is place on using multiple sources of knowledge to build a holistic, integrated or systems-oriented understanding. This represents a new approach, where non-state actors are no longer simply recipients of knowledge, but also *knowledge generators*. The capability to address environmental governance challenges rests on efforts that develop mutual respect for, and trust in, plural knowledge systems. In this context, "knowledge co-production" has been emphasized as a primary concern in governance processes – a concern that has evolved from the interdisciplinary field of Sustainability Science. Knowledge co-production is an approach that connects technical experts and formal science with other groups in society to generate new knowledge collaboratively. Most recent considerations concerning the role of science and knowledge in environmental governance emphasize that transitions towards sustainability require joint fact-finding processes where different non-state and state actors have produced the knowledge and information relating to the type of society desired, and the strategies to achieve that desired outcome.

Examples from many contexts illustrate the challenges associated with moving towards knowledge co-production in environmental governance. Where complementary forms of knowledge and different capabilities of actors have been recognized, valuable bridges and robust connections are made by drawing on science and local knowledge. However, there is a recognition in the literature that many formally-trained experts and government managers are skeptical of the knowledge of other actors (especially local knowledge of certain groups or where knowledge is unwritten or experiential). As well, knowledge is more than facts and data points; thus, it is shaped by worldviews, different assumptions, and rules of acquisition. Commensurability and integration of different types of knowledge is not always possible. To overcome these challenges, bridging organizations often are identified as necessary. Bridging organizations can create the conditions in which different actors can collaborate, deliberate to generate new knowledge and make sense of knowledge from different sources. At the core of emerging concerns about knowledge in environmental governance is acceptance that knowledge is dynamic and contingent because it is formed, validated and adapted in the context of changing conditions.

Sources: (Cortner 2000; Kates, *et al.* 2001; Clark 2001; Backstrand 2003; Edelenbos, *et al.* 2004; Parliamentary Commissioner for the Environment 2004; Jasanoff 2004; Reid, *et al.* 2006; Hahn, *et al.* 2006; Blackstock and Carter 2007; Davidson-Hunt and O'Flaherty 2007; Berkes 2009)

Table 2: Summary of Key Concerns Pertinent to Environmental Governance

Topic	**Key Concerns**
Accountability and legitimacy	• Legitimacy in distributed modes of governance emerges from relationships in addition to law • Accountability must be redefined when governance involves a host of state and non-state actors • Different models of governance involve different kinds of accountability
Actors and roles	• The move from government to governance means new actors with new roles are critical • The failure to match the level of participation to appropriate authority and roles undermines future distributed governance efforts • Ambiguity in roles can be a weakness (if it leads to duplication and gaps) or a strength (if it increases adaptability and flexibility) • Equity implications are associated with the devolution of power to non-state actors • Boundary organizations can play key roles in linking (e.g., state and non-state actors) and knowledge production (below)
Fit, interplay and scale	• Governance for social-ecological systems cannot function effectively at only one scale • Scale mismatches, poor understanding of cross-scale and cross-level interactions lead to ineffective governance • Horizontal and vertical linkages among the various actors at different scales and levels are essential • Multi-level governance may lead to increased accountability problems or can produce excessive organizational complexity
Adaptiveness, flexibility and learning	• Adaptive approaches are needed to address uncertainty and change that characterize social-ecological systems • Adaptive capacity and social learning are needed • Effective and collaborative learning depends on participation of multiple actors (state and non-state)
Evaluation	• When governance involves interactions across multiple scales and levels, evaluation is essential but challenging • Evaluation can be the basis for understanding tradeoffs among options, measuring outcomes and learning collaboratively • Evaluation of governance processes is important, but outcomes (ecological, economic and social) also must be evaluated • Indicators can be used as an evaluative tool, but determining appropriate indicators is challenging, and care is needed to avoid focusing only on easily measurable phenomena
Knowledge	• Environmental governance of complex social-ecological systems requires knowledge that is widely distributed among state and non-state actors • Scientific and traditional/local knowledge is needed to create holistic or system-oriented understanding, but integration of knowledge types can be challenging • Non-state actors are knowledge generators as well as recipients, making co-production of knowledge essential (between state and non-state actors) • Bridging organizations can facilitate knowledge co-production

3.4. Summary

A global transition from government to governance is occurring in many fields. This shift is particularly important in the environmental realm. The transition from government to governance involves a reshaping of the roles of state and non-state actors, and is accompanied by new perspectives on the environment, on society, and on relationships between social and ecological systems. Importantly, contemporary perspectives on governance – whether for international relations or the environment – consistently portray governance as being *goal-oriented* and involving interventions in society. In the context of the environment, governance has become a major concern because of a desire to bring about change in the way decisions are made, and because it is almost universally recognized that traditional approaches to governing have not, and perhaps cannot, create the outcomes that are desired (e.g., better water quality, healthier ecosystems).

The contemporary governance literature offers a host of insights that can be used to reconceptualize conventional environmental governance. In summary, these include the following:

- Many *models* exist, including those based on regulation, markets, and collective action by civil society. There are endless variations of these models, reflecting local socio-economic, political, cultural and historical circumstances. And, in the real world of environmental governance, there are numerous hybrids that involve combinations of these models.
- Emerging environmental governance approaches often are a reaction to well-documented problems with traditional (usually command-and-control) approaches. Problems commonly relate to value and interest disputes, cross-scale problems, bureaucratic and hierarchical arrangements, and an inability to deal with uncertainty and complexity. Emerging approaches therefore typically emphasize group decision making that accommodates diverse views, networks and hybrid partnerships among state and non-state actors, social learning, and adaptation.
- Challenges to implementing emerging environmental governance approaches that are promoted in the literature, and found in practice, are numerous. Major concerns relate to actors and the roles they play in governance; ensuring accountability and legitimacy; matching governance arrangements to appropriate scales, and handling the interplay between and among scales and levels; adaptiveness, flexibility and learning; evaluation; and knowledge.

From the perspective offered in this section, it is clear that environmental governance is becoming more complex. More fundamentally, new ways of governing require different skills, attitudes and assumptions.

4. Water Governance Challenges

In Section 3, it was argued that environmental problems being experienced today require innovative governance approaches. This certainly is the case in the context of water management, in general, and water allocation, in particular. Issues pertaining to six key concerns that are especially pertinent to environmental governance were discussed in broad terms. In this section, the goal is to explore these issues in the context of water, drawing on experiences from around the world.

- In Section 4.1, insights pertinent to water governance are presented. The goal is to provide a few examples relative to each of the six key environmental governance concerns discussed in Section 3.3.
- In Section 4.2, a brief case study of water governance in the Murray-Darling Basin, Australia, is used to illustrate challenges and opportunities relative to the six key governance concerns. Interrelationship among these challenges are emphasized.

4.1. Key Governance Concerns in the Context of Water

Governance has emerged as a critical concern during the past decade in the specific context of water (Rogers and Hall 2003; Scholz and Stiftel 2005b; de Loë and Kreutzwiser 2006; Pahl-Wostl and Jeffrey 2008; Schnurr 2008). Importantly, those interested in water governance are not simply a subset of the larger group of people interested in environmental governance. Authors concerned with water governance have drawn from the same basic pool of ideas discussed at the outset in this section. For example, writing for the Global Water Partnership, Rogers and Hall (2003) defined water governance as “the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society”. This definition is grounded in the perspective on governance offered by Kooiman (1993), a prominent governance scholar, but, like much of the earlier water governance literature, does not strongly reflect writing from the environmental governance field.

The water governance literature adds value to the environmental governance literature, drawing on a vast body of literature in the water field that deals with related concerns. This includes work relating to integrated water resources management and adaptive water management (Scholz and Stiftel 2005b; Pahl-Wostl, *et al.* 2007a; Pahl-Wostl, *et al.* 2007b). Concern for governance in the water field complements and builds on extensive experiences with collaboration and the associated complexities of working at a watershed scale (Lubell 2004; Margerum and Whitall 2004; Blomquist and Schlager 2005; Imperial 2005; Sabatier, *et al.* 2005; Ferreyra, *et al.* 2008).

Accountability and Legitimacy

When one actor is primarily responsible, accountability can be clear. In contrast, knowing who is accountable is problematic when environmental governance is based on networks, and where power and authority are shared amongst a variety of actors (Blair 2000; Agrawal and Lemos

2007). Furthermore, legitimacy and accountability are closely related. In order to determine who should be held accountable, the legitimacy of the actors and the process must first be established. These challenges are evident in numerous real-world water governance situations.

In their study of adaptive water management strategies, Gearey and Jeffrey (2006) found that the legitimacy in network governance structure appears invisible because power is not officially delegated. As a result, the legitimacy of the actors and the governing processes are called into question. In the context of integrated watershed management, Blomquist and Schlager (2005) note that the use of a watershed boundary further complicates accountability issues. Decision-making scales such as states may conflict or be incompatible with the watershed boundaries used in integrated watershed management approaches. To address this concern, Blomquist and Schlager (2005) suggest that accountability may have to be established through the horizontal and vertical interactions that characterize networked water governance systems. In other words, checks and balances can be created when ideas and actions are challenged by the various members of the governance systems (O'Toole 1997).

A more concrete approach is used in Australia, where natural resource management organizations (some based on watershed boundaries and some based on administrative boundaries) play key roles in water governance (Robins and Dovers 2007). To ensure accountability in decisions made by catchment management bodies, detailed procedural requirements are established (e.g., relating to reporting to governments), and performance indicators and targets for environmental conditions based on biophysical attributed have been defined by the Commonwealth government (Wallington and Lawrence 2008). A side effect of this approach is that governance focused primarily on meeting procedural and performance requirements can undermine relationships among the various actors (at the same level, and across levels), and thus takes attention away from local issues and concerns (Wallington and Lawrence 2008; Bhat 2009).

Studies aimed at uncovering how legitimacy can be achieved have found that legitimacy can result through dialogue among the actors involved (Gearey and Jeffrey 2006; Connelly, *et al.* 2006). To illustrate, Connelly, *et al.* (2006) studied interaction among actors involved in policy making in the Peak District National Park in England. They found that legitimacy was produced through dialogues among governance actors regarding rules and procedures at the outset of policy making processes. However, they also concluded that the process of establishing legitimacy had to be repeated every time actors changed, and at the start of every new process. Gearey and Jeffrey (2006) came to a similar conclusion in their study of three water governance programs, in Australia, England and Ontario. Legitimacy, they found, was subject to constant review, assessment, and revaluation, suggesting that what is considered legitimate may be in constant fluctuation. Studies such as these suggest that legitimacy is conditional, and must be established in all governance processes. Simply having participants ask “do we accept this process as an appropriate way to make policy – here, now?” may be a useful starting point (Connelly, *et al.* 2006, 270).

For policy makers and government actors interested in creating an enabling environment for innovative governance processes, relying on participants to continually self-define legitimacy may prove impractical. Fortunately, the literature offers a wide range of methods that can be used to support this process, including regular evaluations, creating multiple sources of accountability, and using different kinds of knowledge to create checks and balances (Van Kersbergen and Van Waarden 2004). At a basic level, it is important to remember that legitimacy can flow from accountability, e.g., legitimacy is created when accountability exists in decision making (Van Kersbergen and Van Waarden 2004). Furthermore, evidence suggests that continual attention in governance processes to creating and re-creating legitimacy through the numerous interactions that occur in networked governance can have a positive lag effect (Welch 2002).

Actors and Roles

Identifying actors, clarifying their roles, determining how they will be engaged and ensuring that they have adequate capacity to participate effectively are necessary first steps in water governance processes. The spectrum of actors in water governance is vast, and can include government agencies, water users, Indigenous peoples, corporations and non-government organizations. Ensuring that all potential actors are engaged effectively and appropriately can be extremely difficult. For instance, environmental governance efforts in Canada have grappled with the challenges of engaging the First Nations who are both government and social actors (Phare 2005). In the context of water allocation in Canada, the role of Indigenous people is changing due to critical court decisions. Thus, they now must be seen as a part of civil society as well as representatives of a self-governed nation in Canada (Phare 2005; de Loë, *et al.* 2007).

Shifting from one governance model to another can result in a lag between agreement on basic principles such as public involvement and their actual implementation. For instance, even though calls for public involvement in water resource decision making at the international level were accepted, public involvement in the Mekong River Commission's activities was largely ceremonial and did not provide clear rules for engagement (Chenoweth, *et al.* 2002; Lebel, *et al.* 2005). Conflicts between new governance mechanisms and existing structures can also be problematic. Germany's participation in the European Union's Water Framework Directive requires member countries to define a single and comprehensive responsible authority for each water body (Neef 2008). However, Germany already had existing state water authorities, and chose to place responsibility within these existing bodies. This reflected a reluctance to provide new roles and opportunities for other actors. One outcome of this decision was strong feelings of disempowerment among local government representatives and other stakeholders, who concluded that their contributions would not be taken seriously (Neef 2008). Transferring long-held responsibilities from state actors to non-state actors as part of a new approach to governance also can be challenging. For instance, in Ontario it has been difficult for citizen organizations to integrate their environmental monitoring and evaluation efforts with provincial government programs (Savan, *et al.* 2004).

Problems such as these can be addressed. For example, as the government of New Zealand has worked to create effective environmental policy and to implement new approaches to governance, it has added the role of boundary organizations to the list of governance actors. Boundary organizations, defined as "institutions that straddle the shifting divide between politics and science" (Parliamentary Commissioner for the Environment 2004, 70), can administer the interface between governance actors, and facilitate the communication and transfer of knowledge between them (Carolan 2006). Numerous examples of these organizations exist. In the Red River Basin shared by Canada and the United States, the Red River Basin Commission represents people and organizations (government and non-government at all scales) on both sides of the international boundary and takes a watershed-wide perspective. The Commission's *Red River Basin Natural Resources Framework Plan* is a voluntary initiative designed to provide goals and objectives for the integrated management of the land and water resources of the basin (Red River Basin Commission 2005).

Fit, Interplay and Scale

Issues of fit, interplay and scale are a central concern in the context of water governance because water is a fundamentally cross-scale, multi-level resource. One of the most challenging issues for water governance is the mismatch between administrative areas and natural resource boundaries (e.g., municipalities and watersheds) (Heikkila 2004; Blomquist and Schlager 2005). This mismatch requires the collaboration of multiple administrative units (Enserink, *et al.* 2007). Returning to the example of the Mekong Basin, the Mekong Agreement only covers the lower half of the river basin (Sneddon and Fox 2006). Lao, Thailand, Cambodia and Vietnam are included, but the headwater countries of Tibet and China are excluded. This situation reflects a geopolitical reality that is commonplace in the 263 international watercourses shared by 145 countries (Loures, *et al.* 2008).

Organizations that are based on watershed boundaries and which have legal mandates do exist; Ontario's conservation authorities are a well-known example (Johnson, *et al.* 1996; Krause, *et al.* 2001). However, even in Ontario, conservation authorities share responsibility for water with numerous other actors, including municipalities and provincial and federal government agencies (Hill, *et al.* 2008). Thus, creating watershed management organizations to address the mismatch between ecological systems and administrative systems is not a panacea. More fundamentally, viewing the watershed as the sole or primary scale for water governance is inappropriate because watersheds are hydrologic rather than economic or social units (Blomquist and Schlager 2005; Grigg 2008). As numerous authors have noted, watersheds are not necessarily a meaningful frame of reference for governance to stakeholders (Allan 2003b; Biswas 2004; Ferreyra, *et al.* 2008).

Issues such as scale mismatches and the failure to consider cross-scale and cross-level interactions cannot be addressed simply by creating new organizations based on ecological or hydrological units. More promising are attempts to overcome cross-scale, multi-level challenges of water governance that involve hybrid forms of environmental governance based on flexible, multi-actor partnerships interacting across multiple levels (Margerum 2007). For instance, Parker, *et al.* (2009) found that a partnership that formed to address non-point source pollution in Ohio was effective precisely because the process was driven by local needs and common values, and, importantly, the flexible nature of the partnership. The key was that the structure for collaboration was not imposed from above. In another example, water governance in the more than 100 river basins existing in Brazil takes place through multi-actor councils that include actors from civil society, government, and private and corporate water users (Agrawal and Lemos 2007). These councils use a host of environmental governance mechanisms including stakeholder participation, private-public partnerships for water resources development projects and water permit and charging systems to permit for comprehensive water governance processes (Abers 2007; Agrawal and Lemos 2007). River basins, in this example, provide a frame of reference for the various actors, and a focus for understanding and evaluating hydrological and related ecological processes.

Adaptability, Flexibility and Learning

Adaptive approaches are an important part of any strategy designed to address the uncertainty that is characteristic in social-ecological systems. Adaptive water governance is a way to deal with this uncertainty, but these demand careful attention to linkages among multi-level institutional arrangements, and to different kinds of learning.

Water management has always demanded the ability to deal with uncertainty. For instance, daily, seasonal, and annual changes in precipitation, stream flows, lake levels and other characteristics of the water cycle are normal (Cech 2003). Historically, there is considerable evidence of success in dealing with variability. A key factor contributing to this success has been the predictability of climatic variability (Kabat and van Schaik 2003). Unfortunately, climate change is producing much greater complexity and uncertainty because it is no longer possible to assume that future climatic variability will fall within past observed ranges of variability (Milly, *et al.* 2008). Thus, in contexts such as water allocation, flexibility and adaptability are even more important than has been the case in prior decades. Experiences from around the world highlight the need to be able to respond to new demands for water originating from population growth and economic development; new societal expectations regarding governance, the goals of management, and ecosystem conditions; new actors; and new or changed scientific understanding of key processes (Milich and Varady 1998; Kistin and Ashton 2008; Drieschova, *et al.* 2008; Swatuk and Wirkus 2009). Flexibility and adaptability in water allocation can be enhanced, it has been shown, through mechanisms such as periodic reviews; limited terms on allocations; special provisions for meeting environmental water needs; mechanisms for dealing with extreme circumstances such as droughts; information sharing; and the ability to make adjustments in response to changing circumstances and new knowledge (McCaffrey 2003; Sengo, *et al.* 2005; Alearts and Dickinson 2009). As noted in Section 1.2, market mechanisms increasingly are being advanced as a way of promoting flexibility and adaptation (Young and McColl 2005).

Effective learning – individual, social and organizational – is an important precondition for successful adaptive management. In a case from Scotland, social learning proved useful for creating flexible and adaptable water governance relating to the development of the Scottish Water Bill (Ison and Watson 2007). Development of the Bill engaged actors beyond those in government to include environmental non-government organizations. Consequently, through knowledge sharing, exposure to plural forms of knowledge and negotiation among the actors, the process of developing the Bill achieved revised definitions of the water environment that were agreeable to all parties, identified appropriate spatial boundaries for water governance activities, and led to agreements for joint flood management and mechanisms to provide opportunity for double loop learning (Ison and Watson 2007). Actors involved in the process noted that the presence of environmental NGOs, a strong set of networks within the general population and the structure of the country's parliament were conducive to providing for social learning opportunities (Ison and Watson 2007).

Evaluation

Evaluation of water governance inputs, processes, and outcomes is essential. Evaluation can clarify tradeoffs among options, demonstrate the utility of governance activities, contribute to learning, and help in the identification of alternatives. In multi-level, multi-scale environments that are common in water governance, evaluation is not only essential, but also extremely challenging (Blackstock and Carter 2007; Plummer and Armitage 2007a). Development of measurable indicators of social and environmental outcomes that can be used proactively, e.g., to evaluate whether or not actors involved have the necessary capacity, and retroactively, e.g., to learn from successful and unsuccessful processes, is therefore a priority.

Identifying and assessing outcomes that address key components of a water governance process is a key aspect of evaluation. However, the literature tends to focus on tangible social outcomes that are easily identified and measured, such as whether or not agreement was reached (Blackstock and Richards 2007; Antunes, *et al.* 2009). As a result, less tangible social outcomes often are ignored. Connick and Innes's (2003) evaluation of several water management programs in California uncovered both tangible and intangible social outcomes, including increased social and political capital; consensus on data and formulations of shared understandings; the ending of political and management stalemates; enhanced learning and changed behaviours beyond actors directly involved in the process; and institutions and practices that provided for greater flexibility. For instance, in the Sacramento area, water purveyors formed an agency to manage groundwater resources collectively. Distinctive features of this institution include the use of collaborative dialogues among diverse stakeholders regarding policy, monitoring and implementation issues. Criteria used to identify these outcomes included the extent to which participants are encouraged to challenge assumptions and foster creativity, the degree to which processes are self-organizing, and whether or not the process incorporates many kinds of high-quality information. In a similar vein, Blumenthal and Jannink (2000) used evaluative criteria in their comparison of common co-management methods applicable at the watershed scale. These included participation (who is involved); institutional analysis (rules of how the process is organized and how actors interact with each other); simplification of the natural resource (to what degree does the method narrow or simply the water system under question); spatial scale (at what scale is the method appropriate or applicable); and stages in the process of natural resource management (when in the broader process of management is the collaborative method effective?) (Blumenthal and Jannink 2000).

Tangible and intangible social outcomes are important. However, analysts also have noted that in evaluations of environmental governance processes, social outcomes often receive more attention than ecological outcomes such as measurable improvements in environmental conditions (Plummer and Armitage 2007a; Mandarano 2008). As noted in Section 3, governance has become a priority precisely because people wish to improve environmental conditions. To address this concern, Mandarano (2008) evaluated the outcomes of an initiative designed to address environmental concerns in the New York-New Jersey Harbor Estuary. Social outcome criteria similar to those used by Connick and Innes (2003) were used, but environmental outcome criteria also were evaluated. These included the extent to which environmental features were protected from further development, and improvement in environmental parameters. A host of similar criteria developed for different contexts is evident in the literature. For example, the concept of sustainability draws attention to the importance of improving the quality and quantity of water available for present and future generations, and for the maintenance and improvement of ecological functions (Blackstock and Carter 2007).

Evaluation of social and environmental outcomes of environmental governance is needed (Mandarano 2008). However, an important finding in research relating to evaluation in the context of water governance is that simplistic criteria applied universally to all settings are not appropriate (Lockie, *et al.* 2002). Additionally, a rigid-focus on performance indicators and target conditions for resources, at the expense of encouragement of long-term change in behaviour and attitudes, can be problematic (Wallington and Lawrence 2008). In the multi-level, multi-scale settings characteristic of water governance, criteria typically will have to be negotiated among the participants. A beneficial side effect of this process is increased legitimacy due, for instance, to shared understanding of the knowledge that will be used in evaluating governance processes. Caution should also be exercised regarding expectations. As Lubell, *et al.* (2005) argue it is virtually impossible to measure and attribute improvements in water quality directly to a collaborative process.

Knowledge

Water governance efforts have recognized the need to draw on multiple forms of knowledge, facilitate the co-production of knowledge and ensure that the boundaries between knowledge generation and implementation are bridged. Yet, effectively achieving these goals remains problematic.

A critical knowledge interface exists between knowledge generation and policy implementation (Edelenbos, *et al.* 2004; Parliamentary Commissioner for the Environment 2004). Typically, science-policy communication promotes a linear flow of information from science to policy makers, but Cross and Smith (2007) argue that this must be “replaced by a notion of partnership through reciprocal learning among those involved in the process”. In their examination of environmental flow assessments for the Pangani River Basin in Kenya and Tanzania, they found that the integration of diverse interests and knowledge led to improved social learning for the research group as a whole, and more robust environmental flow data, which also improved decision making and long term strategy planning for the water resources in the Basin (Cross and Smith 2007). Adopting a non-linear perspective on knowledge is an important way to promote adaptability and flexibility. For example, knowledge regarding environmental water needs is changing in response to new scientific understandings (Drieschova, *et al.* 2008). Water allocation systems that can incorporate new knowledge (whether generated from scientific or other sources) are likely to be more flexible and adaptable.

Unfortunately, integrating scientific and technical knowledge with local knowledge in real-world water governance processes is challenging (Ivey, *et al.* 2006; Taylor, *et al.* 2008). A review of social learning processes for an integrated water resources management (IWRM) program in the Usangu Plains of Tanzania uncovered barriers to the science-policy interface between scientists and the resource users. The basin provides a critical resource for irrigation and livestock watering and hydro power generation, but is also a RAMSAR wetland site, and, as a result, there is conflict between competing demands for the resource (Lankford, *et al.* 2004). The study found that dramatic differences in scientific and local knowledge interpretations of the availability of the basin's resources prevented social learning from taking place and led to a stalemate in the IWRM program (Lankford, *et al.* 2004). The authors concluded that highly entrenched views existed between each group and a lack of acknowledgement regarding knowledge uncertainty, and poor management of science uptake into policy prevented social learning in the basin, and consequently dynamic IWRM planning (Lankford, *et al.* 2004)

Acknowledgment of the necessary need for science-policy integration in the European Union's Water Framework Directive led to the creation of a framework in which experts from EU member states, industry, agriculture and scientists can have effective dialogue regarding science-policy coordination. This framework provides a necessary means for coordination not only between science and policy, but also between the various EU member countries, and promotes the sharing of best practices and promotes knowledge sharing between 20 different languages (Quevauviller, *et al.* 2005). It also provides a forum for scientists to work collaboratively with policy makers to create "science-digested" policy briefs. The goal is to ensure that science outputs are appropriately translated for the needs of policy makers, and that the public can contribute to the development of well-informed policy (Quevauviller, *et al.* 2005, 205).

4.2. Synthesis: Water Governance in the Murray-Darling Basin, Australia

The six issues discussed in Section 4.1 are evident in numerous real-world water management settings. One region of the world where they can all be seen clearly, and where interactions among them are revealed, is the Murray-Darling Basin (MDB) in Australia.

Australia's iconic MDB covers approximately 1 million km^2, or just over 14% of the country's total land area (Australian Bureau of Statistics 2008). The basin is shared by the states of New South Wales, Victoria, Queensland and South Australia and by the Australian Capital Territory (ACT). Its population of approximately 2 million people resides primarily in New South Wales (39%) and Victoria (29%) (Australian Bureau of Statistics 2008). Urban areas with 25,000 or more people represent approximately 40% of the basin's population. Agriculture is extremely important in the basin. Crop and livestock production in 2005-06 generated AUD$15 billion or 39% of the total value of agricultural production (Australian Bureau of Statistics 2008). Importantly, 65% of Australia's irrigated land is located in the basin, making agriculture the primary user of water.

Streamflow in the MDB is highly variable from year-to-year, and seasonally. Floods and extreme low flows are common, especially in the Darling River and its tributaries. Annual discharge at the mouth of the River Murray has ranged from 1.626 million dam^3 to 54.168 million dam^3 with a median of 8.49 million dam^3 (Murray-Darling Basin Commission 2005). However, during the past decade, flows have been much lower than usual due to the worst drought in Australia's recorded history (Connell 2007a). Salinity, land degradation, loss of bio-diversity and stress on aquatic ecosystems caused by drought-induced low flows and heavy water use pose significant long-term problems (Prasad 2008). Adding to these concerns, climate change has been identified as an extremely serious threat in Australia (Pittock 2003). Studies suggest that the irrigation economy of the basin, already under extreme pressure, may disappear due to climate-induced water shortages (Garnaut 2008). Reflecting these concerns, water governance in Australia has been the subject of a host of reforms since the early 1990s.

Historically, water governance in Australia was state-centric, and involved top-down approaches to planning and decision making. State governments made water allocation decisions, and owned and operated irrigation districts. This changed starting in the early 1990s, as recognition of the economic impacts of water scarcity and degraded ecosystems became widespread.

- The first major shift in governance in this time period occurred under the 1994 Council of Australian Governments (COAG) water reforms (COAG 1994). The COAG framework established new principles for water management, including water pricing that reflected volumetric consumption and full cost pricing, the separation of water entitlements from rights in land, and a focus on meeting environmental water needs. The COAG reforms created new roles in water governance for irrigators, specifically, and communities, generally.
- As pressure on water resources increased throughout the 1990s, a national consensus formed that additional reforms were needed (Wentworth Group of Concerned Scientists 2003). Governments responded by creating the 2004 National Water Initiative (NWI). The NWI expanded water trading and focused attention on the environmental and economic needs of the MDB (McNamara 2007).
- The third, and most recent, major reforms to water governance in the MDB were instituted under the *Water Act 2007*, which established a new inter-state Murray-Darling Basin Agreement, and created an overarching body for governance in the basin: the Murray-Darling Basin Authority.

State and Commonwealth governments continue to be critical actors in water governance in the MDB. However, under the reforms that have occurred since 1994, responsibility for governance has been distributed beyond governments. To illustrate, under legal reforms implemented in response to the 1994 COAG agreement, locally-organized catchment (watershed) management organizations in each state are required to define environmental water needs and to determine how water available for consumption will be shared among existing entitlement holders (Smiley, *et* *al.* In Press). More recently, the Murray-Darling Basin Authority is charged with the task of creating a single, consistent and integrated basin plan, and public involvement and consultation in this process are required (Commonwealth of Australia, *et al.* 2008). Finally, through the creation of water markets and the transfer of irrigation districts to private corporations, key decisions about how water will be used in the MDB are now being made by individuals and companies that are engaged in trading on the water market.

Following the various reforms instituted since 1994, water governance in the MDB clearly involves hybridization of several of the "ideal" models discussed in Table 1. The regulatory model remains the cornerstone of governance, but market regulation is a key tool for allocating water resources, co-operative management is used at key planning stages, and a variety of approaches are used to engage citizens. Adaptive management is an explicit goal of water reforms (Allan 2008). Thus, experiences in the MBD offer numerous insights relating to the six concerns discussed in Section 4.1. Examples are presented in the following bullets.

- Questions of accountability and legitimacy abound. In some respects, accountability is clear and well defined (e.g., authority and responsibility are clearly delineated through a host of laws and policies at the Commonwealth and State levels). However, irrigators in New South Wales are extremely skeptical about planning processes (Kuehne and Bjornlund 2006), and the legitimacy of the entire process of community-based catchment planning has been undermined by the fact that plans have been suspended due to the drought (Smiley, *et al.* In Press).
- The range of actors involved in water has broadened considerably relative to previous decades. Governments (State and Commonwealth) play key roles, but individuals and corporations participating in water markets are now central actors in water governance, and catchment management organizations comprised of individual and sector representatives now have legally-defined planning roles. The Murray Darling Basin Authority has emerged as a boundary organization, in some important respects mediating between the Commonwealth, state governments and water users and citizens.
- Considerable efforts have been made to address questions of fit and interplay between scales and among levels of governance. For instance, interrelationships between governance at the basin and catchment scales are identified and clarified in laws and policies. Interrelationships between economic and environmental objectives, and between land use practices and water management activities, are acknowledged and addressed. Relationships among State-level institutions, and between State and Commonwealth institutions, are identified and detailed. At the same time, the system that has been created is exceptionally complex; the *Water Act 2007* alone is 543 pages. And, it is important to remember that due to the severity of the drought, it appears already that reforms have largely failed to achieve sustainable levels of extraction and to secure water supplies for key environmental sites (Thoyer 2006; Connell 2007b; Young and McColl 2008). Thus, a threshold appears to have been crossed and the system is now experiencing what are described as "cascading effects". Even though some spatial fit issues have been addressed, the problems clearly have not been resolved.

- A specific goal of water reforms has been to increase adaptiveness and flexibility in water allocation and management in the MDB (Allan 2008). For instance, the Murray-Darling Basin Agreement includes measures designed to permit adaptation to changed climatic and economic circumstances. These include provisions for flexible apportionment among states based on water resource conditions; special provisions for dealing with droughts and low flows; basin-wide planning that shapes water sharing objectives and provides a larger framework for catchment-level planning through state processes; procedures for regular plan revision and amendment; and a framework for water trading that, depending on its final form, may create considerable flexibility. Unfortunately, as noted above, even these measures may not be enough.
- Given the complexity of water governance in the MDB, evaluation clearly is essential. A defining characteristic of water reforms is the focus on environmental targets and outcomes. For example, the Murray-Darling Basin Agreement creates a framework for specific targets and objectives for environmental quality relating to environmental flow, water quality, salinity and other concerns (Commonwealth of Australia, *et al.* 2008). Details on many issues, including monitoring and reporting regimes and plan review and amendment procedures, will be established in the basin plan that the Murray-Darling Basin Authority is required to develop. A series of "due diligence" criteria are specified in the Agreement; these are used in due diligence assessments conducted by the Commonwealth in considering State priority projects. At the same time, however, it must be remembered that with the suspension of water sharing plans, markets are becoming the primary vehicle for ensuring water for the environment and reducing over-allocation (Loch, *et al.* 2009). Thus, different evaluation criteria and procedures may be needed to reflect the ways in which governance will actually occur.
- Finally, the case of water governance in the MDB reinforces the importance of knowledge. The social-ecological system in question is exceptionally complex, and the knowledge needed to support effective governance is distributed among a vast range of state and non-state actors. Catchment-scale planning mechanisms provide a forum for holders of different kinds of knowledge to engage with each other, and to create a holistic understanding of environmental and economic water needs. Through these mechanisms, non-state actors can be knowledge generators as well as knowledge recipients (Smiley, *et al.* In Press). However, the suspension of these processes due to the drought means that the scientific and economic knowledge of actors involved in basin-scale planning through the Murray-Darling Basin Authority likely will be privileged. This is problematic because in some cases trust between local users and government agencies has been damaged due to disputes regarding the quality and accuracy of scientific data (Pigram 2006).

4.3. Summary

The global transition from government to governance is prominent in the context of water. Governments remain key actors, often, as in the case of Canada, due to their constitutional responsibilities for water. Nonetheless, in countries around the world it is now widely accepted that governments on their own lack the necessary resources, skills, knowledge, and legitimacy needed to address contemporary water-related challenges. Key concerns relating to water governance were highlighted in Section 4.1. These can be addressed in numerous different ways. The case of water allocation in the Murray-Darling Basin demonstrated one approach, involving combinations of governance models (regulatory, collaborative, market), and reflecting a high degree of attention to the kinds of concerns discussed in Section 4.2. Australia is a world leader in water reform. Unfortunately, the water crisis in Australia's Murray-Darling Basin is so severe and so advanced that no amount of water reform may be adequate to the task. This reinforces the urgency of strengthening water governance long in advance of a crisis.

5. Conclusions

In countries around the world, water governance is in transition. Where once governments were the main, and sometimes only, actors involved with water governance, they now share accountability and decision making with citizens groups, a diverse range of private sector organizations (e.g., corporations, non-governmental organizations), public-private partnerships and quasi-governmental boards. This shift is occurring for many reasons. Most fundamentally, it reflects a widespread realization that governments no longer can be the only actors because of capacity limitations; an unwillingness of citizens to play passive roles; and the fact that environmental management is becoming increasingly complex.

The shift "from government to governance" is neither straightforward nor linear – especially in the context of the environment where governance is dynamic and multi-level, and where innovative approaches to governance are needed. A consensus is emerging that governance should involve forms of group decision making that accommodate diverse views, that networks and hybrid partnerships among state and non-state actors are needed, that shared learning is critical, and that governance should provide opportunities for adaptability and positive transformation. However, accomplishing governance that reflects this consensus is not simply a function of picking a new model based on a simplistic comparison of strengths and weaknesses (e.g., "markets" or "co-operative management" instead of traditional regulatory approaches). It also cannot be assumed that new kinds of shared governance institutions simply can be grafted onto existing regulatory systems. Instead, the transition from government to governance demands a shift in thinking about who does what in society, and how social and ecological systems are interconnected. Critical questions such as those posed at the outset in this report must be addressed:

- Who should be involved in governance, and how is that decided?
- What roles should the various people and organizations involved play, and how is that determined?
- What is the appropriate scale for decision making (e.g., local, regional or national; administrative units or natural units such as watersheds)?
- Which sources of knowledge will be used in decision making, and how is the validity of different kinds of knowledge evaluated?
- Who ultimately is accountable when governance occurs through multiple organizations at various scales?

While ideal "models" that answer these questions can be identified, it is important to remember that in reality the different ways of governing are virtually endless. Therefore, attention is increasingly being directed at hybridized forms of governance and strategies for governance. At the same time, it must be recognized that how these questions are answered in a specific place reveals basic norms, goals and assumptions regarding how society should be organized, which problems are important, how those problems should be addressed, and by whom.

From this perspective, experiences from other jurisdictions can provide valuable lessons and insights regarding the strengths and weaknesses of different approaches. However, the combination of governance models and approaches that is most appropriate in a particular place can only be determined with reference to the local context. Simplistic, one-size-fits-all solutions imported from other jurisdictions are neither appropriate nor likely to be successful.

Alberta is a case in point. The province faces a diverse range of water-related challenges, including scarcity in southern river basins where irrigation predominates; water quality contamination from urban, industrial and agricultural development; and degraded habitat in watersheds where pressures from human uses are most intense. Climate change, in combination with the impacts of additional economic development, will magnify many of these concerns. Under Canada's constitution, primary responsibility for water management clearly rests with the provincial government in Alberta. For example, in the case of water allocation, all rights in water are vested in the Crown under the *Water Act.* Thus, provincial officials are responsible for issuing licenses to users, and for ensuring that Alberta's obligations to downstream provinces are met. Nonetheless, the government of Alberta has recognized that a broader range of actors must be involved in water governance. To facilitate shared governance, the provincial Water for Life strategy establishes three kinds of partnerships operating at the provincial, basin, and local scales. Adding to the complexity of water governance in Alberta is the fact that the province also has embarked on a new approach to land use planning and cumulative effects management that further distributes responsibility for environmental governance in the province.

These considerations partly define the "local" context for water governance in Alberta. In addressing them, Alberta must confront many of the governance-related challenges raised in this report. Specific questions that will need to be answered include the following:

- What relationships will exist between existing regulatory approaches (such as water allocation under the *Water Act*) and new ways of governing (such as the partnerships created under Water for Life)?
- How will voluntary watershed-based planning initiatives be integrated with new regional planning and cumulative effects management systems that involve institutions that have legislated decision making responsibilities?
- Which social and environmental process-based and outcome-based measures will be used to determine whether or not governance is effective?
- How can accountability be created and maintained in an environment where responsibility for decision making is shared among a diverse range of actors inside and outside of government, some with legislated responsibilities and others operating on a voluntary basis?

The governance literature reviewed in this report is not simply a source of abstract frameworks and critiques of existing practices. Instead, this literature offers a foundation of empirical examples and theoretical conceptualizations that permit sensible decisions about what can be done, and what should be done, in considering these kinds of questions. It is not the purpose in this report to offer a governance roadmap. Nonetheless, the literature reviewed for this study does provide key insights that those involved in reshaping water governance in Alberta can bear in mind. From among the many insights discussed in Sections 3 and 4, the following seem particularly relevant to circumstances in Alberta:

- The extent to which new approaches to governance involving sharing of authority and responsibility build upon existing and well-established mechanisms must be carefully considered during implementation of Water for Life, the new Land-Use Framework and the emerging Cumulative Effects Management system. Conflicts among new mechanisms, and between new mechanisms and existing structures, may be expected if care is not taken to address questions of fit and interplay.
- Governance will always involve a shifting mix of spatial boundaries and scales. In the context of water in Alberta, watersheds clearly are a relevant unit for organizing information, for planning, and for evaluating impacts and outcomes. However, it cannot be assumed that they are automatically an appropriate unit for *governance* involving multiple actors and decision making settings (land use planning, economic development, etc.). Therefore, as is the case wherever watersheds play a role in governance, effective networks can transcend spatial boundaries to connect actors and facilitate decision making across levels and scales. However, establishing and maintaining these networks is a non-trivial challenge.
- New actors typically face financial, technical and other constraints on their capacity to be involved in governance. Therefore, incentives and mechanisms will be needed to ensure that their involvement leads to tangible, meaningful results. Evidence from around the world demonstrates clearly that the failure to match the level of participation to appropriate authority undermines future efforts to share responsibility for water governance.
- Evaluation of social and environmental outcomes of governance is an important way to measure success, but simplistic criteria applied universally are not appropriate. A rigid focus on performance indicators and target conditions for resources, at the expense of desired long-term change in behaviour and attitudes, can be especially problematic.
- Change and uncertainty are normal in the complex environment in which water is situated. Therefore, adaptive approaches are needed that permit flexible adjustments and learning in response to changed conditions. As governance is transformed, especially through legal and regulatory mechanisms, it will be critical to ensure that the potential for adaptation is preserved.
- Finally, the knowledge needed to address complex problems associated with water and environmental governance is held by a diverse range of actors inside and outside of government. Different kinds of knowledge (e.g., scientific and local) are needed, and a different approach is required, which recognizes that actors outside of governments can be knowledge generators as well as knowledge recipients.

6. Appendix: Annotated Bibliography of Key References

6.1. Governance Theory

Kooiman, J. 1993. *Modern Governance: New Government-Society Interactions*. London, United Kingdom: SAGE Publications Ltd.

Kooiman, J. 2003. *Governing as Governance*. Thousand Oaks, California: SAGE Publications Ltd.

These two seminal works on governance provide an exhaustive look at the concept from a broad perspective, and, combined, demonstrate an evolving understanding of the meanings and applications of governance. The books draw on a range of disciplines to explore the different elements, modes and orders of governing and governance, and are useful for providing a foundational understanding of the concept and its intricacies.

Rhodes, R. A. W. 1997. *Understanding Governance: Policy Networks, Governance, Reflexivity and Accountability*, 1st Edition. Buckingham, United Kingdom: Open University Press.

A collection of published articles on governance, the author argues that there has been a "hollowing out" of the state and an emergence of policy networks that have transformed the processes of governance. The book examines decentralized decision making through policy networks and raises important practical questions of how to explore and gain an understanding of policy networks, and how these policy networks may operate within a governance context. The book also explores what policy networks will mean for governing accountability, sustainability and responsiveness. The book provides an important perspective on the use of governance within the public administration field and its emergence specifically within the British governing system. Thus, it is useful for comparative purposes.

Stoker, G. 1998. Governance as theory: five propositions. *International Social Science Journal* 50(155): 17-28.

This article provides an exploration of the theoretical underpinnings of governance from a political science perspective. It reviews the various definitions of government and governance as they relate to the public administration field. The article puts forth five propositions regarding the characteristics of governance and examines them in the context of the delivery of public services in Britain. The article is useful in demonstrating the broader use of governance and mapping its application to the field of political science and public administration.

Van Kersbergen, K. and Van Waarden, F. 2004. Governance as a bridge between disciplines: cross-disciplinary inspiration regarding shifts in governance and problems of governability, accountability and legitimacy. *European Journal of Political Research* 43: 143-171.

A comprehensive study of nine approaches to governance, this article notes the multi-disciplinary nature of the concept and is inclusive in its review of governance used in the private, semi-private, public, local, regional, national, transnational and global spheres. Additionally, the authors explore the horizontal and vertical shifts in power in the governance approaches, and examine the implications for governability, accountability and legitimacy, concluding with a discussion of emerging responses to these issues. This article is useful for providing a comprehensive conceptual understanding of governance and its associated challenges.

6.2. Environmental Governance

Ali-Khan, F. and Mulvihill, P.R. 2008. Exploring collaborative environmental governance: perspectives on bridging and actor agency. *Geography Compass* 2(6): 1974-1994.

This article examines the recent experiences of environmental governance practitioners in North America and uncovers barriers to effective collaboration. After a thorough review of current approaches, the authors note the emerging focus on networks as a mechanism for environmental governance. They explore network theory and the concepts of bonding and bridging between actors to understand how networks and social capital is formed. The authors suggest that a greater role for governments to facilitate and support network development would improve environmental governance. This article is useful for its proposal of networks as an environmental governance mechanism and its discussion on the role of governments within these networks.

Armitage, D. 2008. Governance and the commons in a multi-level world. *International Journal of the Commons* 2(1): 7-32.

This article examines the concept of multi-level governance and in doing so suggests that contributions from commons theory, resilience thinking and political ecology can contribute to a more robust understanding of governance. The author draws on examples from six international case studies to contextualize multi-level governance and notes that variations in governance form and function are socially, historically and politically situated. The article is useful for gaining an appreciation of how concepts found outside of the environmental governance literature can strengthen the concept of environmental governance. Contributions from commons theory, resilience thinking and political ecology are particularly useful in broadening the scope of environmental governance to include issues such as power differences, roles for different actors, vertical and horizontal linkages and social learning.

Armitage, D.R., *et al.* 2009. Adaptive co-management for social-ecological complexity. *Frontiers in Ecology and the Environment* 7(2): 95-102.

This article provides a detailed review of the foundations of adaptive co-management and relates this concept to environmental governance. The authors suggest that adaptive co-management is an evolutionary process that provides for flexibility and the emergence of innovations. They suggest that adaptive co-management provides for an examination of issues such as power, and the integration of science into policy making within governance, issues that until now have been largely ignored. This article provides a useful elaboration of adaptive co-management, and its place within the broader concept of environmental governance, as well as exploring at length its associated challenges.

Biermann, F., et al. 2009. Earth System Governance: People, Places and the Planet. Science and Implementation Plan of the Earth System Governance Project, ESG Report No. 1. Bonn, IHDP: The Earth System Governance Project.

This report is the product of the efforts of the Earth System Governance Project, a long term research project of the International Human Dimensions Program on Global Environmental Change. The project provides a science and implementation plan for four global systems including water, food, climate and economy. The plan seeks to provide "strategies for Earth System management" and examines issues of architecture, agents, adaptiveness, accountability and legitimacy, and access and allocation in an effort to assist with policy responses to these problems. This document is useful for providing an understanding of environmental governance issues at the global scale and to highlight international efforts to address these challenges.

Duit, A. and Galaz, V. 2008. Governance and complexity – emerging issues for governance theory. *Governance: An International Journal of Policy and Administration* 21(3): 311-335.

The authors propose that abrupt changes are taking place across broad scales due to a variety of social, biophysical, economic and environmental factors. Consequently, they argue that linear, scale-free and static approaches to solving issues associated with change are no longer viable. This article examines the adaptive capacity of several governance models and their ability to govern complex adaptive systems, in an effort to uncover opportunities to maintain human wellbeing, political stability, and democratic vitality. This article is useful for its placement of governance challenges beyond the scope of environmental issues due to its consideration of social and economic concerns, and for its examination of the adaptive capacity of various governance models.

Folke, C., *et al.* 2005. Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources* 30: 441-473.

This article focuses on two social issues related to adaptive management – identifying social capacities that can manage abrupt change, and understanding how these social capacities can be developed. Key topics of discussion include the role of leaders, the self-organization of networks for knowledge sharing and social learning, and the significance of bridging organizations for adaptive management in social-ecological systems. The authors argue that a better understanding and application of these capacities will allow for a more resilient social-ecological system. This article is useful for placing environmental governance issues within the concept of resilience, and for its exploration of socially adaptive capacities.

Glasbergen, P. 1998. The question of environmental governance in *Co-operative Environmental Governance; Public-Private Agreements as a Policy Strategy*, Glasbergen, P., 1-20. Dordrecht, The Netherlands: Kluwer Academic Publishers.

This chapter explores the five models of governance used as a framework for this book. It discusses each of the models at length, and provides a critical assessment of each. It suggests that several models often exist in conjunction with each other within a governing context, as no one model is ever used in isolation. This chapter is useful in providing greater detail to the models of governance provided in Section 3 of this report.

Lemos, M.C. and Agrawal, A. 2006. Environmental Governance. *Annual Review of Environment and Resources* 31: 297-325.

The article explores issues of environmental governance from a global perspective with a focus on its application to climate change and ecosystem degradation. In doing so it first examines a variety of definitions of environmental governance from the globalization, decentralization, market and individual incentives-based governance, and cross-scale governance literatures. It then investigates, and critically assesses several emerging hybrid modes of governance including co-management, public-private partnerships and social-private partnerships. The article is useful for presenting an examination of the environmental governance literature from the global perspective, and introduces notions of incentive-based governance.

Parliamentary Commissioner for the Environment. 2004. *Missing Links: Connecting Science With Environmental Policy*. Wellington, New Zealand: Parliamentary Commissioner for the Environment.

The report by the Parliamentary Commissioner for the Environment in New Zealand critically considers the science-policy interface in an effort to better understand how it can be utilized to overcome issues of uncertainty, complexity, and sustainable development for environmental policy making. It examines the challenges posed by environmental policy making and how they relate to scientific knowledge generation and dissemination. It also tries to provide some understanding of the issues surrounding uncertainty and complexity and concludes with a proposal for responding to the dynamics of the environmental policy making context. The report is a useful example of a government trying to contend with the environmental and science challenges it faces.

Plummer, R. and Armitage, D. 2007. Crossing boundaries, crossing scales: the evolution of environment and resource co-management. *Geography Compass* 1(4): 834-849.

The article presents a discussion on the historical development of co-management, tracking its development as an environmental governance model. In a critical assessment of the concept the authors draw on 15 years of experience to suggest that issues regarding power-sharing and representation remain a point of contention. The article also notes the emerging challenges of addressing issues surrounding uncertainty and complexity as well as the concept's theoretical development, evaluation, culture and ethics, adaptation and learning. It concludes with a discussion on the remaining utility of co-management. This article is useful for its comprehensive review of co-management's historical development as well as its highlight of key present and emerging challenges facing the environmental governance model.

Sonnenfeld, D.A. and Mol, A.P.J. 2002. Globalization and the transformation of environmental governance. *American Behavioral Scientist* 45(9): 1318-1339.

The authors review the transformation of environmental governance through the impacts of globalization – specifically supra-national institutions and multi-lateral agreements. In doing so, the article provides particular focus to the effects of market based environmental reform, the role of environmental non-governmental organizations, and the rise of global civil society. This article's contribution to the environmental governance literature is especially useful for its examination of environmental governance from the global to local perspective within the context of perpetual change.

Wallington, T.J. and Lawrence, G. 2008. Making democracy matter: responsibility and effective environmental governance in regional Australia. *Journal of Rural Studies* 24(3): 277-290.

This article details the shift from government to community driven natural resource management in Australia. It discusses the broadened engagement of non-state actors, and evaluates which model of governance is more effective. In this context it then goes on to consider the evolving concept of responsibility and notes the shift from autonomous responsibility to shared responsibility and its associated issues. In doing so, it characterizes the necessary social enabling environment that is required to support this shift in forms of responsibility, and notes the current discord between current and necessary forms of responsibility and accountability. It then draws on the concept of adaptive management to provide suggestions for moving towards more responsive forms of environmental governance. This article is a useful case example of a governing system's shift between governance models and its associated challenges, but is also particularly important for its discussion on a social enabling environment for different forms of responsibility and accountability.

6.3. Water Governance

Connick, S. and Innes, J.E. 2003. Outcomes of collaborative water policy making: applying complexity thinking to evaluation. *Journal of Environmental Planning and Management* 46(2): 177-197.

This article argues that too often evaluations of collaborative policy making determine that a process was successful if it reached and implemented an agreement. The authors suggest that there are a number of other, less tangible outcomes which are just as important, if not more so, for effective collaborative policy making. They suggest that outcomes such as social and political capital, agreed-on information, the end of stalemates, high-quality agreements, learning and change, innovation and new practices involving networks and flexibility are important for collaborative processes and policy because they offer opportunity to respond to the complexity and uncertainty which exists within current policy environments. This article contributes to the governance literature by broadening the spectrum of policy outcomes and suggesting additional evaluative criteria for collaborative processes.

de Loë, R. C. and Kreutzwiser, R. D. 2006. Challenging the status quo: the evolution of water governance in Canada in *Eau Canada: The Future of Canadian Water Governance*, Bakker, K., 85-103. Vancouver: University of British Columbia Press.

This book chapter traces the recent application of water governance, with a specific focus on water governance in Canada. It notes several major factors that have challenged the way water is managed in Canada including an increase in complexity in water management, a decline in federal and provincial involvement in water policy as it was enveloped into sustainable development and ecosystem management strategies, as well as cases of drinking water contamination. The chapter also examines the source water protection program in Ontario as a case example of changing strategies towards water governance. This chapter is useful for highlighting the shift in water governance activities in Canada, and provides specific cases examples to illustrate this shift.

Global Water Partnership. 2003. *Effective Water Governance: Learning from the Dialogues.* Stockholm, Sweden: UNDP.

This report is the output of a set of water forums that were facilitated by the Global Water Partnership (GWP) and the United Nations Development Program, and was presented at the 3rd World Water Forum in Kyoto, 2003. The report outlines the dialogue from the forums, and presents a discussion on the issues that arose. Main issues include distributed governance in water, establishing the enabling environment, economic instruments and financing, capacity building for better water governance, decentralization, basin management including shared waters, and the process of change. The report closes by noting the future activities for the regional offices of the GWP to implement actions noted in the forum. This report is frequently cited for its definition of water governance and is an important example of water governance discussions taking place at the global level.

Pahl-Wostl, C., *et al.* 2008. Governance and the global water system: a theoretical exploration. *Global Governance* 14: 419-435.

The article discusses global water governance issues and challenges. It suggests that water governance requires multi-level governance activities, and calls for better linkages between all levels of water governance. In doing so, the authors provide a brief review of global water agreements, before presenting a conceptual framework for analyzing governance. The framework is then applied to the current global water context and examines issues surrounding globalization/regionalization, centralization/decentralization, formality/informality, and state/non-state actors and processes in global water governance activities. The authors then identify four possible future scenarios for global water governance. The article's importance is in its call for improved linkages between multiple levels of water governance and for the review of global water governance activities.

Rogers, P. and Hall, A. W. 2003. *Effective Water Governance*, TEC Background Papers No. 7, Global Water Partnership Technical Committee (TEC) Background Papers. Stockholm, Sweden: Global Water Partnership.

This document is a sister report to the Global Water Partnership's 2003 document Effective Water Governance: Learning from the Dialogue. While the report initially provides a general discussion on water governance, it primarily seeks to move beyond the dialogue gathered from the water governance forums, to present tangible actions for water management to address both natural resource and social needs to achieve effective water governance. This report is particularly useful for its attempt to operationalize the principles of water governance (primarily within the context of developing countries), while recognizing that water management is an inherently political activity.

Sabatier, P., et al. 2005. Swimming Upstream: Collaborative Approaches to Watershed Management. Cambridge, MA: The MIT Press.

Primarily based on American examples, the book examines issues surrounding collaborative watershed management from a number of perspectives. It tackles topics such as trust, shifts in water governance approaches, changing forms of legitimacy, evaluation and social capital. It also evaluates approaches to collaborative processes to determine their utility for generating collective action. In addition, it examines theoretical frameworks for understanding collaborative process successes. This book builds on the literature listed regarding collaborative processes, yet its contribution of theoretical frameworks for water governance evaluation is particularly important.

Schnurr, M. 2008. Global water governance: managing complexity on a global scale in *Water Politics and Development Cooperation: Local Power Plays and Global Governance*, Scheumann, W., Neubert, S., and Kipping, M., 107-120. Berlin, Germany: Springer-Verlag.

This article proposes that the establishment of a coherent global water governance architecture would provide for more efficient responses to international water management challenges. The author reviews current international water policy and identifies the challenges faced by water governance actors and processes. The article finds that poor national water governance impacts international water governance activities and suggests that a number of actions could improve this situation. Actions include the expansion of United Nations-Water into a multi-agency organization, more binding international rules for sustainable water management and the water supply and sanitation sector, and the empowerment of nation states to better support the functioning of global governance. This article focuses on possible actions for global water governance that incorporate actions at other levels, and in doing so is useful for its suggestions regarding the restructuring and transformation of global water governance.

Scholz, J. T. and Stiftel, B. 2005. *Adaptive Governance and Water Conflict: New Institutions for Collaborative Planning*. Washington, DC, USA: Resources for the Future.

This book discusses adaptive water governance within the context of several case studies in Florida. It suggests that issues of scale and geography make water management inherently difficult, and conflict inevitable. The chapters assess five noted challenges of water governance including issues of representation, the decision process, scientific learning, public learning, and problem responsiveness in the context of their case studies to evaluate the capacity of adaptive governance to overcoming these challenges. The book is useful for a number of reasons. In particular, it provides an empirical evaluation of the concept of adaptive governance; it considers the utility of governance for contexts characterized by conflict; and, finally, because practitioners, rather than academics, conducted the case study evaluations, an on-the-ground understanding of water governance activities and challenges is provided.

United Nations World Water Assessment Programme. 2003. *Water for People, Water for Life: The United Nations World Water Development Report.* New York: UNESCO Publishing.

The first in a series published every three years, the document takes stock of the world's water resources. It provides a detailed summary of global water conditions, both supply and demand; assesses current international water need challenges; comments on management challenges related to stewardship and governance; reviews global case study examples; and suggests options for moving forward. This document is serves as a comprehensive source of data regarding world water resources and suggests the use of governance mechanisms to overcome water challenges.

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Antunes, P., Kallis, G., Videira, N., and Santos, R. 2009. Participation and evaluation for sustainable river basin governance. *Ecological Economics* 68(4): 931-939.

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